Mobility 2040

Invest in Your Transportation Future

The Update for 2020

2020 LONG RANGE TRANSPORTATION PLAN

CENTRAL MASSACHUSETTS METROPOLITAN PLANNING ORGANIZATION

PREPARED BY:
STAFF OF THE CENTRAL MASSACHUSETTS REGIONAL PLANNING COMMISSION

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Federal Title VI/Nondiscrimination Protections
The Central Massachusetts Metropolitan Planning Organization (CMMPO) hereby states its policy to operate its programs, services and activities in full compliance with federal nondiscrimination laws including Title VI of the Civil Rights Act of 1964 (Title VI), the Civil Rights Restoration Act of 1987, and related federal and state statutes and regulations. Title VI prohibits discrimination in federally assisted programs and requires that no person in the United States of America shall, on the grounds of race, color, or national origin, including limited English proficiency, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity receiving Federal assistance.

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The CMMPO also complies with the Massachusetts Public Accommodation Law, M.G.L. c272 §§ 92a, 98, 98a, prohibiting making any distinction, discrimination, or restriction in admission to or treatment in a place of public accommodation based on race, color, religious creed, national origin, sex, sexual orientation, disability or ancestry. Likewise, CMMPO complies with the Governor's Executive Order 526, section 4, requiring all programs, activities and services provided, performed, licensed, chartered, funded, regulated, or contracted for by the state shall be conducted without unlawful discrimination based on race, color, age, gender, ethnicity, sexual orientation, gender identity or expression, religion, creed, ancestry, national origin, disability, veteran's status (including Vietnam-era veterans), or background.

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Individuals who feel they have been discriminated against in violation of Title VI or related Federal nondiscrimination laws, must file a complaint within 180 days of the alleged discriminatory conduct to:

Ms. Janet Pierce, Executive Director
Central Massachusetts Regional Planning Commission
1 Mercantile Street, Suite 520
Worcester, MA 01608
(508) 756-7717

To file a complaint alleging violation of the State's Public Accommodation Law, contact the Massachusetts Commission Against Discrimination within 300 days of the alleged discriminatory conduct at:

Massachusetts Commission Against Discrimination (MCAD)
One Ashburton Place, 6th floor
Boston, MA 02109
(617) 994-6000
TTY: (617) 994-6196

Translation

English: If this information is needed in another language, please contact the CMRPC/CMMPO Title VI Specialist at (508) 756-7717.

Spanish: Si necesita esta información en otro lenguaje, favor contactar al especialista de Título VI de CMRPC/CMMPO al (508) 756-7717.

French: Si vous avez besoin d'obtenir une copie de la présente dans une autre langue, veuillez contacter le spécialiste du Titre VI de CMRPC/CMMPO en composant le (508) 756-7717.

Portuguese: Caso esta informação seja necessária em outro idioma, favor contatar o Especialista em Título VI do CMRPC/CMMPO pelo fone (508) 756-7717.

Vietnamese: Nếu bạn cần thông tin bằng ngôn ngữ khác, xin vui lòng liên lạc với Tiêu đề VI Chuyên CMRPC/CMMPO tại (508) 756-7717.

Chinese: 如果用另一种语言需要的信息，请联系第六章专门CMRPC/CMMPO（508）756-7717.

Afrikaans: As jy inligting nodig het in 'n ander taal, kontak asseblief die Titel VI Spesialis CMRPC/CMMPO by (508) 756-7717.

ADA/ 504 Notice of Nondiscrimination

The CMMPO does not discriminate on the basis of disability in admission to its programs, services, or activities; in access to them; in treatment of individuals with disabilities; or in any aspect of their operations. The CMMPO also does not discriminate on the basis of disability in its hiring or employment practices.

This notice is provided as required by Title II of the American with Disabilities Act of 1990 (ADA) and Section 504 of the Rehabilitation Act of 1973. Questions, complaints, or requests for additional information regarding ADA and Section 504 may be forwarded to:

Ms. Janet Pierce, Executive Director
Central Massachusetts Regional Planning Commission
1 Mercantile Street
Suite 520
Worcester, MA 01608
(508) 756-7717

This notice and document are available from the CMMPO in large print, on audio tape, and in Braille upon request.

Endorsement of Mobility2040: the Update for 2020 Long Range Transportation Plan

The Central Massachusetts Metropolitan Planning Organization (CMMPO) hereby endorses Mobility2040: the Update for 2020 Long Range Transportation Plan

X	I concur		Date 7-17-19
	I do not concur	Stephanie Pollack, Secretary of Transportation, MassDOT	
✓	I concur		Date 7-17-19
	I do not concur	for Jonathan Gulliver, Administrator, MassDOT –Highway	
✓	I concur		Date 7/17/2019
	I do not concur	Robert Hassinger, Chairperson, CMRPC	
✓	I concur		Date 07.17.2019
	I do not concur	Dennis Lipka, Administrator, WRTA	
✓	I concur		Date 7/17/19
	I do not concur	Edward M. Augustus, Jr., Worcester City Manager	
✓	I concur		Date 7/17/19.
	I do not concur	Barur Rajeshkumar, Representative, North Subregion	
✓	I concur		Date 7/17/19
	I do not concur	Maurice DePalo, Representative, Northeast Subregion	
✓	I concur		Date 7/17/19
	I do not concur	Jesse Limanek, Representative, Southeast Subregion	
✓	I concur		Date 7-17-19
	I do not concur	Dennis Lamarche, Representative, Southwest Subregion	
✓	I concur		Date 7/17/19
	I do not concur	Daniel Bigda, Representative, West Subregion	

Julee Quint

Certification of the Central Massachusetts MPO Transportation Planning Process

310 CMR 60.05: Global Warming Solutions Act Requirements for the Transportation Sector and the Massachusetts Department of Transportation

This will certify that the Long Range Transportation Plan and Air Quality Conformity Determination for the Central Massachusetts Metropolitan Planning Organization (MPO) is in compliance with all applicable requirements in the State Regulation 310 CMR 60.05: Global Warming Solutions Act Requirements for the Transportation Sector and the Massachusetts Department of Transportation. The regulation requires MPO to:

1. 310 CMR 60.05, 5(a)(1): Evaluate and report the aggregate transportation GHG emissions and impacts of RTPs and TIPs;
2. 310 CMR 60.05, 5(a)(2): In consultation with MassDOT, develop and utilize procedures to prioritize and select projects in RTPs and TIPs based on factors that include aggregate transportation GHG emissions impacts;
3. 310 CMR 60.05, 5(a)(3): Quantify net transportation GHG emissions impacts resulting from the projects in RTPs and TIPs and certify in a statement included with RTPs and TIPs pursuant to 23 CFR Part 450 that the MPO has made efforts to minimize aggregate transportation GHG emissions impacts;
4. 310 CMR 60.05, 5(a)(4): Determine in consultation with the RPA that the appropriate planning assumptions used for transportation GHG emissions modeling are consistent with local land use policies, or that local authorities have made documented and credible commitments to establishing such consistency;
5. 310 CMR 60.05, 8(a)(2)(a): Develop RTPs and TIPs;
6. 310 CMR 60.05, 8(a)(2)(b): Ensure that RPAs are using appropriate planning assumptions;
7. 310 CMR 60.05, 8(a)(2)(c): Perform regional aggregate transportation GHG emissions analysis of RTPs and TIPs;
8. 310 CMR 60.05, 8(a)(2)(d): Calculate aggregate transportation GHG emissions for RTPs and TIPs;
9. 310 CMR 60.05, 8(a)(2)(e): Develop public consultation procedures for aggregate transportation GHG reporting and related GWSA requirements consistent with current and approved regional public participation plans;
10. 310 CMR 60.05, 8(c): Prior to making final endorsements on the RTPs, TIPs, STIPs, and projects included in these plans, MassDOT and the MPOs shall include the aggregate transportation GHG emission impact assessment in RTPs, TIPs, and STIPs and provide an opportunity for public review and comment on the RTPs, TIPs, and STIPs.
11. 310 CMR 60.05, 8(a)(1)(c): After a final GHG assessment has been made by MassDOT and the MPOs, MassDOT and the MPOs shall submit MPO-endorsed RTPs, TIPs or projects within 30 days of endorsement to the Department for review of the GHG assessment.

July 17, 2019

7-17-19

Stephanie Pollack, Secretary and Chief Executive Officer
Massachusetts Department of Transportation
Chair, Central Massachusetts MPO

The signatures of the other MPO members may be found on the next page.

7-17-19

for Jonathan Gulliver
MassDOT-Highway
Administrator

Robert Hassinger
CMRPC Chairperson

Dennis Lipka
WRTA Administrator

Edward M. Augustus Jr.
Worcester City Manager

Barur Rajeshkumar
North Subregion Representative

Maurice DePalo
Northeast Subregion
Representative

Jesse Limanek
Southeast Subregion
Representative

Dennis Lemarche
Southwest Subregion
Representative

Daniel Bigda
West Subregion Representative

Central Massachusetts Metropolitan Planning Organization

Listing of CMMPO Members

1. **Stephanie Pollack**, Secretary of Transportation, MassDOT
2. **Jonathan Gulliver,** Administrator, MassDOT-Highway
3. **Robert Hassinger**, CMRPC Chairperson
4. **Dennis Lipka**, WRTA Administrator
5. **Edward M. Augustus, Jr.**, Worcester City Manager
6. **Barur Rajeshkumar**, North Subregion Representative
7. **Maurice DePalo,** Northeast Subregion Representative
8. **Jesse Limanek,** Southeast Subregion Representative
9. **Dennis Lamarche,** Southwest Subregion Representative
10. **Daniel Bigda,** West Subregion Representative

Ex-Officio Members (Non-Voting):

1. **Leah Sirmin,** FTA Liaison
2. **Chris Timmel,** FHWA Liaison
3. **Isabel McCauley,** MPO Advisory Committee Designee

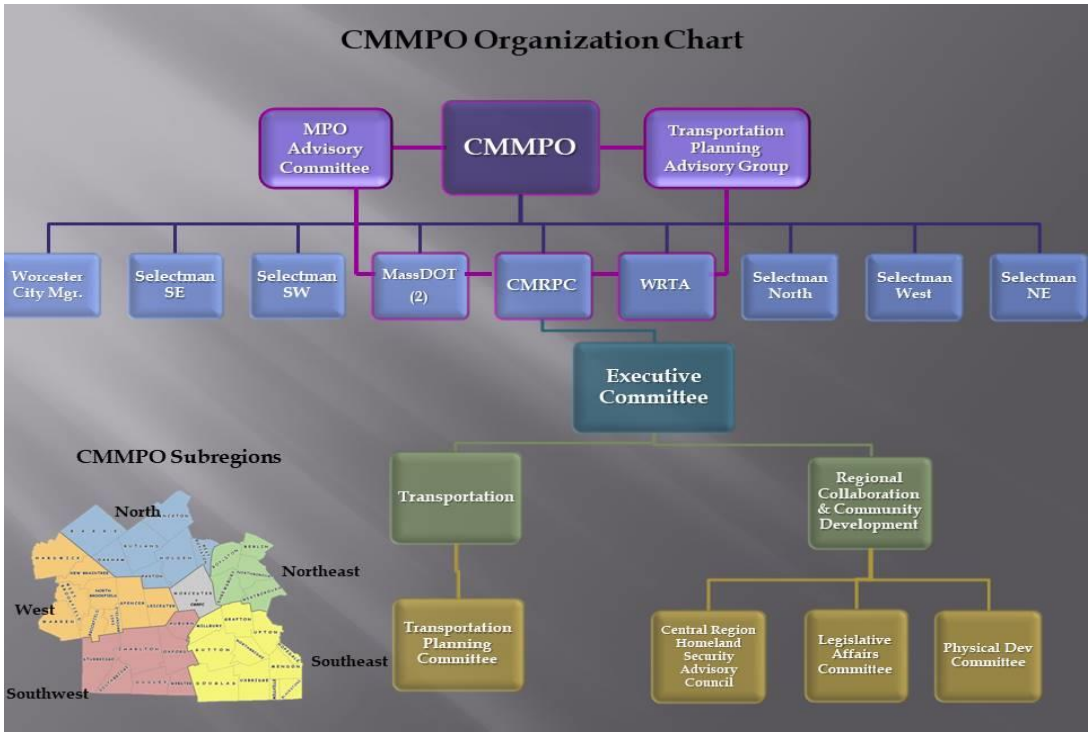
Listing of MPO Advisory Committee Members and Organizations:

1. **Cassandra Anderson**, WDPH/CHRPHA
2. **Gary Bechtholdt**, Town Planner, Town of Northbridge
3. **Sarah Bradbury**, MassDOT-H District 3
4. **John Dewaele**, Grafton and Upton Railroad
5. **Kevin Filchak**, Economic Development and Tourism, Town of Sturbridge
6. **Amanda Gregoire**, Executive Office of Economic Development, City of Worcester
7. **Jim Halpin,** WalkBike Worcester
8. **Laura Hanson**, MassDOT-H District 2
9. **Kathy Joubert**, Planner, Town of Northborough
10. **Joanne Kasper-Dunne**, Service Center, Massachusetts DEP
11. **Billy Krukowski**, Superintendent, Town of Spencer
12. **Joseph Laydon**, Town Planner, Town of Grafton
13. **Paul Matthews**, Executive Director, 495/Metrowest Partnership
14. **Isabel Mccauley**, Town Engineer, Town of Holden
15. **Adam Menard**, Town Planner, Town of Auburn
16. **Diane Shea**, Chief Financial Officer, WRTA
17. **Ann Sullivan**, Projects Engineer, MassDOT-H District 3

Ex-Officio Members (Non-Voting):

1. **Derek Krevat**, MassDOT - OTP
2. **Chris Timmel,** FHWA Liaison

A Metropolitan Planning Organization (MPO) is a transportation policy-making body made up of representatives from local government and transportation agencies with authority and responsibility in metropolitan planning areas. The CMMPO is made up of 10 voting members. The members include MassDOT Secretary of Transportation, MassDOT Highway Administrator, WRTA, CMRPC, the Worcester City Manager, and one selectman from each of the remaining five subregions. Below is a chart of the CMMPO organization as well as the relationships to other boards or committees. The Transportation and Regional Collaboration & Community Development departments of the CMPRC provide recommendations and knowledge to the Executive Committee chair, which is the CMRPC representative to the MPO. The Transportation Planning Advisory Group, which advises the WRTA representative of transit-related issues. The MPO Advisory Committee provides recommendations to the CMMPO on specific strategies or projects. The Advisory Committee may also provide technical analysis, specialized knowledge, and stakeholder input on specific issues. This committee is made up of town officials and a number of representatives from various agencies. Often, Advisory Committee members have expertise in areas other than transportation, such as public health or environmental protection.



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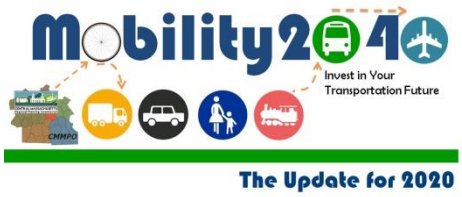
Executive Summary



Overview

Mobility2040 is the Long-Range Transportation Plan (LRTP) developed by the Central Massachusetts Metropolitan Planning Organization (CMMPO) for the south/central Massachusetts planning region. The purpose of the LRTP is to identify the multi-modal transportation needs of the region, the funding available to address those needs, and the project investments and initiatives planned for the next 20-year period. An extensive and targeted public outreach effort was undertaken to achieve both community and stakeholder participation on all aspects of the LRTP update including the most recent regional Performance-Based Planning & Programming (PBPP) efforts, needs identification & prioritization for studies/projects, initiatives and programs, as well as the allocation of the transportation-related funding resources reasonably anticipated to be available to the planning region.

As part of the development of the Mobility2040 Update for 2020, the CMMPO reaffirmed its future transportation-related ***VISION*** for the region:

> *The CMMPO believes that a safe, efficient and well-maintained multi-modal transportation system, along with sensible land use planning and economic development, is an essential component of sustainable public policy aimed at improving people's lives.*
>
> *The CMMPO envisions Central Massachusetts in 2040 as a growing region of 40 well-connected, livable communities with congestion reduction, better multi-modal mobility and improved air quality. Healthy, creative transportation methods that integrate active travel modes using technology will safely and efficiently move people between homes, jobs, and services and move goods between places of manufacturing and retail distribution.*

The Mobility2040 Update for 2020 reflects federal transportation planning emphasis areas by:

- Including the latest evolution of the federally-required MPO Performance Management rules and criteria as well as regionally-customized performance measures;
- Highlighting access to essential services;
- Coordinating across UZA metropolitan planning boundaries; and
- considers a scenario planning approach.

Together these and other federal, state and local focus areas will determine the ideal mix of projects, initiatives, and funding allocation across both transportation modes and programs to

address the identified needs of the Central Massachusetts planning region through 2040. In addition, this LRTP Update also reflects federal guidance regarding:

- Benefits & Burdens analyses to ensure fair treatment for minority, transportation vulnerable and non-minority communities;
- Work to improve livability in the region's communities; and
- Seek sustainability by assessing resiliency while also mitigating the potential effects of climate change.

Further, the LRTP considers MassDOT's efforts to reduce transportation-related greenhouse gases, the Healthy Transportation Compact Policy and other environmental goals of improving the availability of multi-modal, healthy, active transportation options in the central part of the Commonwealth.

The Mobility2040 Update for 2020, with extensive public and stakeholder involvement, also underscores the following regional ***GOALS*** established by the CMMPO:

- **Goal 1**: Reduce Congestion and Improve Mobility for All Modes.
- **Goal 2**: Improve the Safety and Security of the Region.
- **Goal 3**: Achieve a State of Good Repair.
- **Goal 4**: Increase Transportation Options and Promote Healthy Modes.
- **Goal 5**: Reduce Greenhouse Gas and Promote Sustainable Practices.
- **Goal 6**: Equitable Transportation for All Populations.
- **Goal 7**: Improve Economic Vitality and Freight Movement.

Chapter 1 – Introduction and Background

Chapter 1 includes a brief introduction to the CMMPO program areas based on the identified regional needs and priorities. These programs are designed to advance the intended outcomes for the region reflected in the established regional performance measures. Following the program areas summary, the LRTP development guidance and resources are discussed which includes an overview of the Future of Transportation in the Commonwealth report. Next, population and employment projections are shown for all 40 communities in the CMMPO region. This data has been projected out to 2040. The public outreach that occurred throughout the LRTP development is then summarized. This section discusses how the public was informed and involved in the development process. There were a number of meetings with various stakeholders, sub-regional meetings, CMRPC-related meetings, and information tables at different venues and events. The results from all of the outreach activities are also

summarized. The last part of this chapter discusses Title VI, Linguistically Isolated & Environmental Justice (EJ) populations. The accomplishments of the CMMPO are summarized while also listing some of the potential future work.

Chapter 2 – Performance Management

Performance-Based Planning and Programming (PBPP) refers to a transportation agency's application of performance management in their planning and programming processes. The foundation of PBPP was initially federally-legislated through the Moving Ahead for Progress in the 21st Century (MAP-21) and then reaffirmed in the Fixing America's Surface Transportation Act (FAST Act). This chapter includes the current performance measures and targets for the three federal rules of Safety (PM1), Pavement & Bridge (PM2), and System Performance & Air Quality (PM3). In addition, the Federal Transit Authority (FTA) Transit Asset Management (TAM) Rule is also summarized.

Chapter 3 – Transportation Linkages

The LRTP Update for 2020 summarizes the efforts, the accomplishments to date and the identification of future transportation needs in the region in consultation with local communities and in cooperation with public and private entities. This chapter introduces the "linkages" from the transportation planning perspective. These linkages are overachieving themes that influence or are relative to the decision-making process. Since there are real financial constraints to pursue all the transportation needs in the region, the linkages act as a compass by providing thorough and thoughtful weight to the planning process. The linkages discussed in this chapter are Land Use, Economic Development, Travel & Tourism, Transportation & Health, Access to Essential Services, Climate Change & Resiliency, Environmental Profiles and Emerging Technologies.

Chapter 4 – Transportation Modes

The CMMPO's transportation system is a multi-modal network of roads, bridges, transit routes, parking and freight facilities, and bicyclist and pedestrian infrastructure. It is also comprised of vehicles, mobility devices, and IT hardware/software that are often considered ancillary in terms of capital costs but nonetheless are critical transportation system components. Chapter 4 includes a brief overview of each mode and associated CMMPO performance management goals. The modes in this chapter are Bicycle & Pedestrian, Public Transit & Passenger Rail, Automobile, Freight Movement (Highway Trucking & Railroads), and Airport. For each mode a

facility and/or service gap analysis and a needs assessment is summarized along with a prioritization strategy to address the unmet needs is given.

Chapter 5 – Summary of Needs

This chapter summarizes the range of needs identified through the development process for the LRTP Update for 2020. The far-ranging multimodal transportation needs of the region were inventoried in a variety of ways, including broad stakeholder and public input as well as informed through Management Systems data integration efforts. Other needs that have been identified are associated with the transportation linkages subjects discussed earlier in the LRTP. Both modal and individual needs throughout the region are identified for a range of topic areas. These areas include bicycle & pedestrian, public transit, highway, and freight movement. At the end of the chapter, a comprehensive listing of all identified needs throughout the planning region is shown.

Chapter 6 – Programs and Projects Prioritization

Chapter 6 includes the analysis of highway-related Major Infrastructure (MI) projects and initiatives. As part of the analysis, the highway-related MI projects were scored using the performance measure criteria, similar to TIP project scoring. Next, there were two project scenarios for the CMMPO to choose which MI projects will be programmed. These two options were then analyzed using various criteria. The criteria included Travel Demand Modeling, Public Input, Geographic Equity, Title VI, Environmental Justice & Other Vulnerable Populations, Benefits & Burdens Analysis, and Green-House Gas (GHG) Savings. The final results were then summarized and the CMMPO chose their preferred option as part of this plan. The last part of this chapter includes a list of top priorities for each of the program areas.

Chapter 7 – Financial Plan

Federal FAST Act regulations require that the Long Range Transportation Plan to be a financially-constrained document. This chapter includes the two funding options (by program areas) in which the CMMPO was asked to choose their preferred option. Next, the project revenues and expenditures for both highway and transit-related projects were discussed. Additionally, other funding sources such as Chapter 90, Complete Streets, Municipal Rideshare Funds, or the MassWorks Infrastructure Program are also summarized.

Chapter 8 – Air Quality and Greenhouse Gas Assessment

This chapter documents the latest air quality conformity determination for the 1997 ozone National Ambient Air Quality Standards (NAAQS) in the CMMPO Region. It covers the applicable conformity requirements according to the latest regulations, regional designation status, legal considerations, and federal guidance. In addition, a Greenhouse Gas (GHG) assessment is also provided. The assessment report estimates future carbon dioxide (CO_2) emissions from the transportation sector as part of meeting the GHG reductions goals established through the Commonwealth's Global Warming Solutions Act (GWSA). The analysis includes only those larger, regionally significant projects that are included in the statewide travel demand model.

CHAPTER I

Introduction and Background

Introduction

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- **Goal 6**: Equitable Transportation for All Populations.
- **Goal 7**: Improve Economic Vitality and Freight Movement.

CMMPO Program Areas

The identified regional needs and priorities will be addressed by establishing a set of programmatic areas based on the federal transportation planning emphasis areas, regional goals crafted by the CMMPO, the results of the management systems data integration efforts and the public outreach process. The programs are designed to advance the intended outcomes for the region reflected in the established regional performance measures. The five programmatic areas are:

- Major Infrastructure (MI)
    - Mostly related with projects that add capacity to the existing system.
    - The projects have a regional impact and therefore require an extensive public outreach process, modeling scenarios and multi-year financial commitments.

  - Projects are screened with the PM scoring matrix and often allow for significant gains towards CMMPO performance goals.
  - Frequently require a combination of funding sources and strategic partnerships.
- Asset Management and System Operations
  - Related to projects, initiatives and technical assistance that address system reliability and state of good repair.
- Transit Planning and Mobility Management
  - Supports transit planning activities in the region, including the transit authority and other transportation partners, by strategically addressing regional mobility needs for different transit-dependent populations.
- Livability and Healthy Transportation
  - Promotes livable and healthy communities by supporting projects, initiatives and technical assistance that provide and/or enhance transportation options for all ages and abilities.
- Climate Change and Resiliency
  - Promotes climate change awareness by identifying best practices and supporting the region's communities in the implementation of resilient strategies through transportation projects, initiatives or technical assistance.

By adopting these programs to address identified regional needs and priorities, each area has the strong potential to advance multiple performance goals simultaneously, improve cost-effectiveness, and support the CMMPO's decision making process while.

Each of the five programs will encompass projects, initiatives or technical assistance to the region's communities. The priorities from each of the program areas will also be tied to funding and financial constraint, which will be addressed in detail in Chapter 7. Moreover, the programs will be supported by three main areas:

1. Data Management Systems,
2. Performance Management Systems, and
3. Transportation Equity.

LRTP Development Guidance & Resources

The transportation staff of the CMMPO was provided guidance for the development of the LRTP update by US DOT, both FHWA and FTA, and MassDOT Office of Transportation Planning. US DOT "Metropolitan Transportation Plan" Guidance was provided by FHWA and FTA in

December 2018. In addition, aspects of US DOT's Federal Certification Findings for the CMMPO, Recommended Course of Action dated May 2017, are also addressed in the LRTP update. MassDOT-OTP guidance for the development of the update was provided in December 2018. Supplementing the OTP guidance, state transportation secretary Pollack encouraged MPOs across the state to both consider and incorporate the recommendations of the Baker Administration's Commission on the Future of Transportation in the Commonwealth in the LRTP updates. A summary of the Commission's recommendations, also released in December 2018, is provided below. Further, it should be noted that the Boston Urbanized Area (UZA) Memorandum of Understanding (MOU) for the conduct of the ongoing "3C" Process, signed in 2018, was also followed by the CMMPO staff when compiling the LRTP update.

Future of Transportation in the Commonwealth Report Overview

The report produced by the Commission on the Future of Transportation in the Commonwealth, released in December 2018, is presented in two parts:

1. Volume I, Choices for Stewardship: Recommendations to Meet the Transportation Future
2. Volume II, Choices for Stewardship: Background Books – Facts, Trends & Issues

In turn, Volume I is presented in three (3) major sections. The first section details the facts, trends, and issues Commissioners reviewed as they envisioned various scenarios of the future and developed recommendations to the Governor for how to best prepare the transportation system for 2040. The second section reviews the Commission's scenario planning process, an exercise that Commissioners used to develop plausible visions of what the future might look like according to variations in two trends: the adoption rate of technological innovation, and the distribution of residents and jobs. This scenario planning work informed recommendation development by providing a framework for considering how different strategies may be applied to different futures.

One of the scenarios explored by the Commission was the Multiple Hubs scenario. The underlying concept is that these hubs have higher rates of residents who are unemployed, low-income, and higher rates of households without access to a car, but at the same time, these areas also have many amenities that employers, entrepreneurs and residents seek but cannot afford in an area closer to Boston. It is anticipated that high density growth will occur at these regional hubs, also known as Gateway Cities, throughout the Commonwealth. This will in turn expand mobility options, increasing the affordable housing inventory while also fostering economic development and job creation.

The Commission's recommendations are then presented in the third section of the report. There are five categories introducing a total of 18 recommendations. Each recommendation consists of a comprehensive recommendation providing longer-term guidance with an eye to 2040, why this recommendation is important as well as some initial next steps. *The first 16 recommendations do not include consideration of necessary resources. The Commission provides such input on governance and resources in the last two recommendations.* The categories and recommendations are included below.

Five Thematic Categories with 18 Recommendations

I. Modernize existing state and municipal transit and transportation assets to more effectively and sustainably move more people throughout a growing Commonwealth.

1. Prioritize investment in public transit as the foundation for a robust, reliable, clean and efficient transportation system.
2. Transform roadways and travel corridors to move more people and support changing travel modes and technologies.
3. Work with multiple stakeholders to better manage today's traffic congestion – and the congestion challenges of the future.

II. Create a 21st century "mobility infrastructure" that will prepare the Commonwealth and its municipalities to capitalize on emerging changes in transportation technology and behavior.

1. Establish a Commonwealth Transportation Technology Transformation Initiative (T3I) to promote solutions to our most complicated transportation issues and build upon our reputation in transportation innovation and technology.
2. Support and accelerate efforts to consume transportation differently.
3. Enable and promote a statewide telecommunications infrastructure to support the availability of real-time transportation information and deployment of connected & autonomous vehicles.
4. Develop a long-term strategy for supporting connected & autonomous vehicles in Massachusetts.
5. Enable and promote a ubiquitous electric charging (and/or alternative fuel) infrastructure to support the widespread deployment of electric and autonomous vehicles.

III. Substantially reduce greenhouse gas (GHG) emissions from the transportation sector in order to meet the Commonwealth's Global Warming Solutions Act (GWSA) commitments, while also accelerating efforts to make transportation infrastructure resilient to a changing climate.

1. Establish a goal that beginning in 2040, all new cars, light duty trucks, and buses sold in Massachusetts will be electric or use another technology that meets the same emissions standards.
2. Collaborate with other Northeast and Mid-Atlantic states to establish a regional, market-based program to reduce transportation sector greenhouse gas (GHG) emissions.
3. Make all current and future critical state and municipal transportation infrastructure resilient to a changing climate.
4. Ensure that enough electric capacity is available to provide reliable, clean and competitively priced power supplies for all electricity users as electrification of the transportation sector accelerates.

IV. Coordinate and modernize land use, economic development, housing and transportation policies and investment in order to support resilient and dynamic regions and communities throughout the Commonwealth.

1. Adopt land use policies and practices that support more dense, mixed-use, and transit-oriented development (TOD).
2. Use land use, economic development, and transportation policies and investment to enable Gateway Cities and the regions they anchor throughout the Commonwealth to compete for the growing number of residents and jobs.
3. Coordinate the planned reinvention of the MBTA commuter rail system with local, regional, and state land use and economic development strategies to maximize the ridership and economic benefits of the reinvented system.
4. Provide better mobility options in rural communities through reimagined public transportation, community transportation services, and public/private partnerships.

V. Make changes to current transportation governance and financial structures in order to better position Massachusetts for the transportation system that it needs in the next years and decades.

1. Prepare MassDOT and other transportation-related entities to effectively oversee a changing transportation system.

2. Develop a fiscally sound and responsible transportation resource plan to operate, maintain, and upgrade the transportation system.

Population and Employment Projections

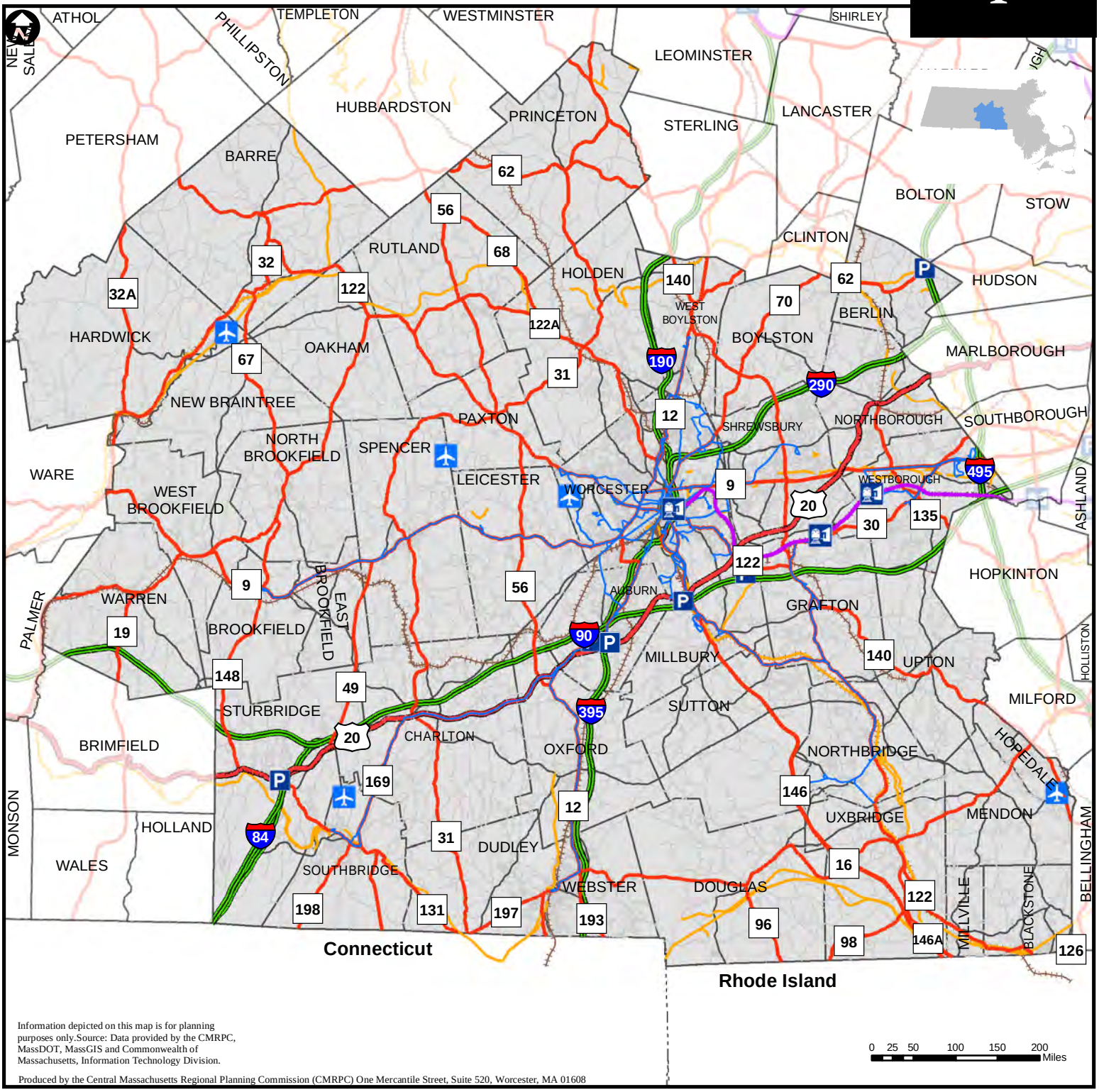
Background

The Central Massachusetts Metropolitan Planning region see Figure I-1 (also referred to as the Central Massachusetts Regional Planning District) is made up of the City of Worcester and the 39 surrounding towns of south-central Worcester County and is one of 13 planning regions in the state. The region is diverse, extending from the urban core of Worcester, the second largest city in the Commonwealth, through the suburban neighborhoods of the nearby towns, to the rural fields and farms of the Brookfields, Hardwick, and New Braintree. It is a transportation crossroads for New England, located at the junction of four major interstate highways and three major railroads. It is centered about 50-60 miles from the major urban areas of Boston, Springfield, Providence RI, and Hartford CT. From Princeton on the north to Douglas on the Rhode Island state line is about 35 miles, and it's about the same distance from Warren in the west to Westborough in the east. The total area of the region is about 960 square miles. It contains the headwaters and main trunk of the Blackstone River, one of the major river basins of Massachusetts and Rhode Island stretching from Worcester to Narragansett Bay near Providence, and includes the John H. Chafee Blackstone River Valley National Heritage Corridor in Massachusetts. Parts of several other river basins are also found within the Region, including the Chicopee, French-Quinebaug, Nashua and Concord-Sudbury-Assabet.

The transportation system in the CMMPO region is a collection of roads, bridges, transit services, freight facilities, bicycle routes, pedestrian facilities and intermodal connectors that need to work as an integrated system within and throughout the 40 communities and beyond. The transportation system is maintained and operated by a number of different agencies, including but not limited to the Massachusetts Department of Transportation, the Massachusetts Bay Transportation Authority, the Massachusetts Port Authority, the Department of Conservation and Recreation, and local entities.

Historically the region was a center for agriculture, manufacturing, and education. In recent years both agricultural and manufacturing activity has declined significantly, although still important to the local economy. New, high-tech and biotech firms have come to the region,

taking advantage of the well-educated workforce. In addition, healthcare systems are also significant employers.



Information depicted on this map is for planning purposes only.Source: Data provided by the CMRPC, MassDOT, MassGIS and Commonwealth of Massachusetts, Information Technology Division.

Produced by the Central Massachusetts Regional Planning Commission (CMRPC) One Mercantile Street, Suite 520, Worcester, MA 01608

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Figure I-1 CMRPC Transportation System Map

- Bicycle/ Pedestrian
- Interstate
- State Route
- US Highway
- Commuter Rail Stations
- Commuter Rail
- ParknRide Lots
- Airport Locations
- WRTA Routes
- New England Rail Roads
- CMRPCTowns

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The trend since the 1950s has been toward increasing residential development outside the central city at the expense of the city's population, although the city has seen a growing interest in urban living. Interstate 495, the fastest growing industrial corridor in the state, brushes the eastern edge of the region and has encouraged rapid residential development in the nearby towns including those in Central Massachusetts. The transportation infrastructure in the region has facilitated the trend of people living in this area while commuting daily to eastern Massachusetts. That trend, too, is expected to continue. This trend is validated by increased auto travel along I-90 and improved ridership on the commuter rail to Boston. Also, the abundance of affordable housing in comparison to housing prices in Eastern Mass is still the trend that is fueling living in Central Mass and commuting to the east. The US Census Bureau produces a data set called the Longitudinal Employer-Household Dynamics Origin-Destination Employer Statistics (LODES) which determines where individuals live and works based on administrative data. The UMDI used the 2011-2015 LODES data to determine that, about half of the Central Massachusetts labor force work outside of the region with 30% of the workers commuting to jobs in eastern Massachusetts. Table I-1 Shows the determined share of labored force as determined by UMDI the table should be read across that that 51.5% of workers work inside of the CMRPC region while 29.3% of workers commute to the MAPC region.

Table I-1: LODES Data Commuting by Region

RPA	BRPC	CCC	CMRPC	FRCOG	MAPC	MRPC	MVC	MVPC	NMCOG	NPEDC	OCPC	PVPC	SRPEDD	Out-of-State
BRPC	68.0%	0.4%	2.9%	1.1%	8.5%	1.0%	0.0%	0.8%	0.7%	0.0%	0.9%	6.7%	1.5%	7.4%
CCC	0.2%	63.2%	1.9%	0.1%	16.1%	0.5%	0.6%	0.7%	0.7%	0.3%	4.5%	1.2%	6.1%	3.7%
CMRPC	0.4%	0.5%	51.5%	0.3%	29.3%	2.9%	0.0%	1.0%	1.4%	0.0%	1.2%	3.8%	2.1%	5.5%
FRCOG	2.1%	0.5%	5.2%	37.2%	10.7%	4.9%	0.1%	1.0%	1.0%	0.0%	1.0%	24.7%	1.8%	9.9%
MAPC	0.2%	0.4%	2.1%	0.1%	85.1%	0.5%	0.0%	1.8%	1.8%	0.0%	2.1%	0.9%	1.7%	3.3%
MRPC	0.6%	0.4%	12.1%	1.3%	27.9%	38.9%	0.1%	1.6%	5.0%	0.0%	0.9%	3.3%	1.6%	6.2%
MVC	0.2%	11.8%	1.4%	0.1%	14.3%	0.6%	52.7%	0.7%	0.7%	2.2%	3.5%	0.9%	7.5%	3.4%
MVPC	0.2%	0.3%	1.6%	0.1%	39.0%	0.8%	0.0%	38.4%	6.9%	0.0%	0.8%	1.1%	1.1%	9.8%
NMCOG	0.1%	0.3%	2.1%	0.1%	44.4%	2.4%	0.0%	8.1%	31.2%	0.0%	0.9%	1.1%	1.1%	8.1%
NPEDC	0.1%	7.3%	1.1%	0.1%	11.9%	0.4%	2.1%	0.4%	0.4%	64.6%	2.6%	0.8%	5.5%	2.9%
OCPC	0.2%	2.4%	1.8%	0.1%	48.1%	0.5%	0.1%	0.8%	0.9%	0.0%	32.3%	1.3%	8.5%	3.0%
PVPC	1.2%	0.3%	3.7%	1.7%	9.1%	0.8%	0.0%	0.8%	0.7%	0.0%	0.8%	68.3%	1.4%	11.3%
SRPEDD	0.2%	2.0%	2.1%	0.1%	24.9%	0.5%	0.1%	0.7%	0.8%	0.0%	8.0%	1.3%	48.2%	11.3%
Out-of-State	2.7%	1.2%	7.0%	0.9%	46.0%	2.2%	0.2%	10.3%	7.1%	0.1%	2.3%	8.3%	11.8%	0.0%

Source: LODES, UMDI Calculations

Future Growth

In the last 30 years, population and employment growth in the Central Massachusetts Region have outpaced the rest of state; however, this growth has not occurred uniformly throughout the region and through the decades. Between 2000 and 2010 employment decreased about 3% and is expected to get back to the 2000 levels on a regional basis by 2040. This was a trend

observed by the entire nation and Massachusetts due to the economic recession in 2007-2008. In order to forecast future trends it is useful for examining the actual demographic trends in Central Massachusetts in the past few decades. Table I-2 and Table I-3 show the population and employment totals for each town in the six subregions for current and projected from 2000 to 2040.

Table I-2: Population Projections

	Population					
	US Census Bureau			CMRPC Projections		
North Subregion	**2000**	**2010**	**2015**	**2020**	**2030**	**2040**
Barre	5,113	5,398	5,444	5,488	5,534	5,736
Holden	15,621	17,346	18,057	18,114	18,778	19,942
Oakham	1,673	1,902	1,992	1,969	2,030	2,053
Paxton	4,386	4,806	4,937	5,054	5,274	5,543
Princeton	3,353	3,413	3,332	3,527	3,639	3,813
Rutland	6,353	7,973	8,562	8,770	9,440	9,793
West Boylston	7,481	7,669	7,642	8,030	8,362	8,866
Total North	**43,980**	**48,507**	**49,966**	**50,952**	**53,057**	**55,746**
Northeast Subregion						
Berlin	2,380	2,866	3,064	3,285	3,497	3,736
Boylston	4,008	4,355	4,414	4,567	4,793	5,026
Northborough	14,013	14,155	13,770	14,517	15,831	16,636
Shrewsbury	31,640	35,608	37,136	38,906	42,090	43,671
Westborough	17,997	18,272	18,309	19,003	20,365	21,160
Total Northeast	**70,038**	**75,256**	**76,693**	**80,278**	**86,576**	**90,229**
Southeast Subregion						
Blackstone	8,804	9,026	9,008	9,305	9,898	10,341
Douglas	7,045	8,471	8,991	9,250	9,645	10,020
Grafton	14,894	17,765	19,088	20,295	22,338	23,465
Hopedale	5,907	5,911	5,831	5,930	6,096	6,309
Mendon	5,286	5,839	5,979	6,159	6,397	6,416
Millbury	12,784	13,261	13,407	13,820	14,828	15,349
Millvile	2,724	3,190	3,400	3,430	3,532	3,622
Northbridge	13,182	15,707	17,070	18,103	20,479	21,755
Sutton	8,250	8,963	9,090	9,362	9,827	10,213
Upton	5,642	7,542	8,362	9,312	11,270	11,857
Uxbridge	11,156	13,457	14,617	15,981	18,681	19,722
Total Southeast	**95,674**	**109,132**	**114,843**	**120,947**	**132,991**	**139,069**
Southwest Subregion						
Auburn	15,901	16,188	16,200	16,752	17,352	18,214
Charlton	11,263	12,981	13,796	13,802	14,675	15,730
Dudley	10,036	11,390	11,947	11,949	12,394	13,403
Oxford	13,352	13,709	13,662	14,366	15,070	15,781
Southbridge	17,214	16,719	16,595	16,426	16,832	17,664
Sturbridge	7,837	9,268	9,736	10,100	11,266	12,092
Webster	16,415	16,767	16,916	17,054	17,640	18,292
Total Southwest	**92,018**	**97,022**	**98,852**	**100,449**	**105,229**	**111,176**
West Subregion						
Brookfield	3,051	3,390	3,514	3,559	3,675	3,745
East Brookfield	2,097	2,183	2,199	2,233	2,297	2,362
Hardwick	2,622	2,990	3,154	3,137	3,200	3,289
Leicester	10,471	10,970	11,117	11,278	11,619	11,898
New Braintree	927	999	1,008	1,032	1,060	1,071
North Brookfield	4,683	4,680	4,592	4,510	4,663	4,804
Spencer	11,691	11,688	11,521	11,174	11,673	11,815
Warren	4,776	5,135	5,297	5,298	5,442	5,559
West Brookfield	3,804	3,701	3,627	3,767	3,727	3,996
Total West	**44,122**	**45,736**	**46,029**	**45,988**	**47,356**	**48,539**
Central Subregion						
Worcester	172,648	181,045	186,272	189,527	194,606	196,501
Regional Total	**518,480**	**556,698**	**572,655**	**588,141**	**619,815**	**641,260**
Projections made based on MassDOT Regional Control Total						

Table I-3: Employment Projections

	Employment					
	or and Workforce Devlopm			CMRPC Projections		
North Subregion	**2000**	**2010**	**2015**	**2020**	**2030**	**2040**
Barre	1,161	1,204	1,272	1,273	1,287	1,304
Holden	3,923	3,478	3,694	3,699	3,738	3,788
Oakham	138	209	216	217	219	222
Paxton	703	813	872	873	883	895
Princeton	805	771	775	776	784	795
Rutland	1,076	1,064	1,164	1,165	1,178	1,194
West Boylston	3,817	3,722	4,118	4,124	4,167	4,224
Total North	**11,623**	**11,261**	**12,111**	**12,127**	**12,254**	**12,421**
Northeast Subregion						
Berlin	666	454	476	476	481	488
Boylston	1,429	1,658	1,647	1,649	1,667	1,689
Northborough	6,923	6,014	6,824	6,833	6,904	6,998
Shrewsbury	14,556	12,898	13,412	13,429	13,570	13,755
Westborough	26,574	23,829	24,944	24,978	25,239	25,583
Total Northeast	**50,148**	**44,853**	**47,303**	**47,365**	**47,861**	**48,513**
Southeast Subregion						
Blackstone	1,192	1,072	1,390	1,392	1,406	1,425
Douglas	887	832	998	999	1,010	1,024
Grafton	4,634	4,050	4,255	4,261	4,306	4,364
Hopedale	1,831	1,584	1,561	1,563	1,579	1,600
Mendon	1,501	1,333	1,418	1,420	1,435	1,455
Millbury	3,884	4,997	5,234	5,240	5,295	5,367
Millvile	202	289	287	287	290	294
Northbridge	4,715	5,154	5,943	5,951	6,013	6,095
Sutton	1,554	2,163	2,241	2,244	2,268	2,299
Upton	1,071	1,063	1,523	1,525	1,541	1,562
Uxbridge	2,828	3,154	3,518	3,522	3,559	3,608
Total Southeast	**24,299**	**25,691**	**28,368**	**28,405**	**28,703**	**29,094**
Southwest Subregion						
Auburn	12,299	9,913	10,186	10,199	10,306	10,446
Charlton	2,839	3,681	4,190	4,195	4,239	4,297
Dudley	2,978	2,774	2,964	2,968	2,999	3,040
Oxford	3,532	4,158	4,472	4,478	4,525	4,586
Southbridge	6,690	5,706	6,556	6,564	6,633	6,723
Sturbridge	5,163	4,596	4,946	4,952	5,004	5,072
Webster	6,667	6,563	7,561	7,571	7,651	7,755
Total Southwest	**40,168**	**37,391**	**40,874**	**40,928**	**41,357**	**41,920**
West Subregion						
Brookfield	499	494	487	487	492	499
East Brookfield	387	396	388	389	393	398
Hardwick	342	392	386	387	391	396
Leicester	2,251	2,180	2,305	2,308	2,332	2,364
New Braintree	157	240	237	237	240	243
North Brookfield	1,251	899	881	883	892	904
Spencer	3,758	3,012	3,188	3,192	3,225	3,269
Warren	1,293	574	600	600	607	615
West Brookfield	956	851	840	841	849	861
Total West	**10,894**	**9,038**	**9,311**	**9,323**	**9,421**	**9,549**
Central Subregion						
Worcester	107,536	95,825	100,204	100,337	101,388	102,768
Regional Total	**244,668**	**224,059**	**238,170**	**238,486**	**240,984**	**244,265**
Projections made based on MassDOT Regional Control Total						

Some Basic Definitions:

Population - All people living in a geographic area.

Household - A person or group of people who occupy a housing unit as their usual place of residence. The number of households equals the number of occupied housing units in a census.

Employment - The total number of persons on establishment payrolls employed full or part time who received pay for any part of the pay period.

In October of 2018, MassDOT, Metropolitan Area Planning Commission (MAPC), and University of Massachusetts Donahue Institute (UMDI) completed the preparation of new population, household, and employment projects to the year 2040 to support regional transportation planning efforts. The Central Massachusetts region's population and employment totals as released were in keeping with the demographic trends the region was experiencing in the past decade. This plan uses several sources for deriving the town level projections. They include, the town-level projections that staff has developed using the previous RTP projection trends, priority development and preservation areas study conducted for the CMRPC region, zoning/parcel information and other known land use/infrastructure constraints from local input.

Future year projections through 2040 are not predictions *per se*, nor are they expressions of an ideal future. They are simply educated assessments which offer a picture of likely socio-economic changes in the region, including the population, number of households and number of jobs by municipality. In providing these projections to each municipality, CMRPC hopes to inform discussion on how communities shape their policies to address expected growth. Together CMRPC and the towns it serves can move the region toward building the future most desired by those who live and work within its boundaries.

Primarily, the demographic data described above has been derived in order to inform this Regional Transportation Plan, out of which flows the Central Massachusetts Transportation Improvement Program (TIP), the annual list of projects slated to receive federal funding. These two documents are prerequisites for the region's eligibility for federal transportation funding. The projections are also used in the region's Travel Demand Forecast model, which estimates the current and future use of the region's transportation infrastructure and aids in analyzing projects being considered for both the RTP and the TIP.

Key Findings

Between years 2010 and 2040 the region is expected to add over 84,500 people, nearly 60,000 household units, and approximately 20,200 jobs. By comparison, in the 30 years between 1980 and 2010, the region added 122,000 people to its population and over 40,000 jobs.

Predicting future demographics is an important aspect to advancing transportation planning. Without the knowledge of where and when people and jobs occur in the future it would be very difficult to address future needs and issues. Mobility2040 plan looks to cater to the transportation needs and address issues for at least 20 years into the future. The travel demand model helps connect the demographic trends with travel patterns and behavior of the travelling public.

Population & Housing

- Currently the Central Massachusetts Region is home to 572,655 people, 8.44% of the Massachusetts population.
- Currently the Central Massachusetts Region contains approximately 221,364 occupied housing units, 7.7% of the state's housing units.
- The communities in the CMRPC region can be grouped in the following three categories based on the past growth trends, available land and infrastructure for future growth, and planned future residential projects. All rates of growth were projected only to the nearest percent, and were discussed with the stakeholders before converting the rates into projected counts.
    - **Low growth communities** (expected to grow at a lower rate than the regional average): Auburn, Barre, Brookfield, Douglas, Dudley, East Brookfield, Hardwick, Holden, Hopedale, Leicester, Mendon, Millville, New Braintree, North Brookfield, Oakham, Paxton, Princeton, Rutland, Southbridge, Spencer, Sutton, Warren, Webster, West Brookfield, and Worcester.
    - **Medium growth communities** (expected to grow at a rate close to the regional average): Blackstone, Boylston, Charlton, Millbury, Oxford, Shrewsbury, West Boylston, and Westborough.
    - **High growth communities** (expected to grow more rapidly than the region as a whole): Berlin, Grafton, Northborough, Northbridge, Sturbridge, Upton, and Uxbridge.

Employment

- In 2000 the Central Massachusetts Region was home to approximately 245,000 jobs, about 7% of the jobs in Massachusetts. This number has decreased to 224,000 in 2010, and in 2040 the region is expected to host 244,000 jobs, about 6.9% of the total jobs in Massachusetts. This trend seems to be on par with historical data.
- The communities in the CMRPC region can be grouped in the following three categories based on the past employment and planned future projects. All rates of growth were projected only to the nearest percent, and were discussed with the stakeholders before converting the rates into projected counts.
    - **Low growth communities** (expected to remain close to the 2010 numbers): Blackstone, Brookfield, East Brookfield, Hardwick, Hopedale, Leicester, Mendon, Millbury, Millville, New Braintree, North Brookfield, Princeton, Southbridge, Spencer, Upton, Uxbridge, Warren, and West Brookfield.
    - **Medium growth communities** (expected to grow at a rate close to the regional average): Auburn, Barre, Dudley, Grafton, Holden, Oakham, Oxford, Paxton, Rutland, Sturbridge, Webster, West Boylston, and Worcester.
    - **High growth communities** (expected to grow more rapidly than the region as a whole): Berlin, Boylston, Charlton, Douglas, Northborough, Northbridge, Shrewsbury, Sutton, and Westborough.

The demographic projections presented here are estimates based on available data and short-term and long-term trends. They provide information to decision makers who can take actions and make choices that might ultimately affect the actual results. Markets and the nature of the transportation and working environments are likely to change between now and 2040, impacting the actual numbers in uncertain ways. Nevertheless, best educated estimates are made in order to have some rational basis for planning. Figure I-2 shows the population projections and Figure I-3 shows the employment projections.

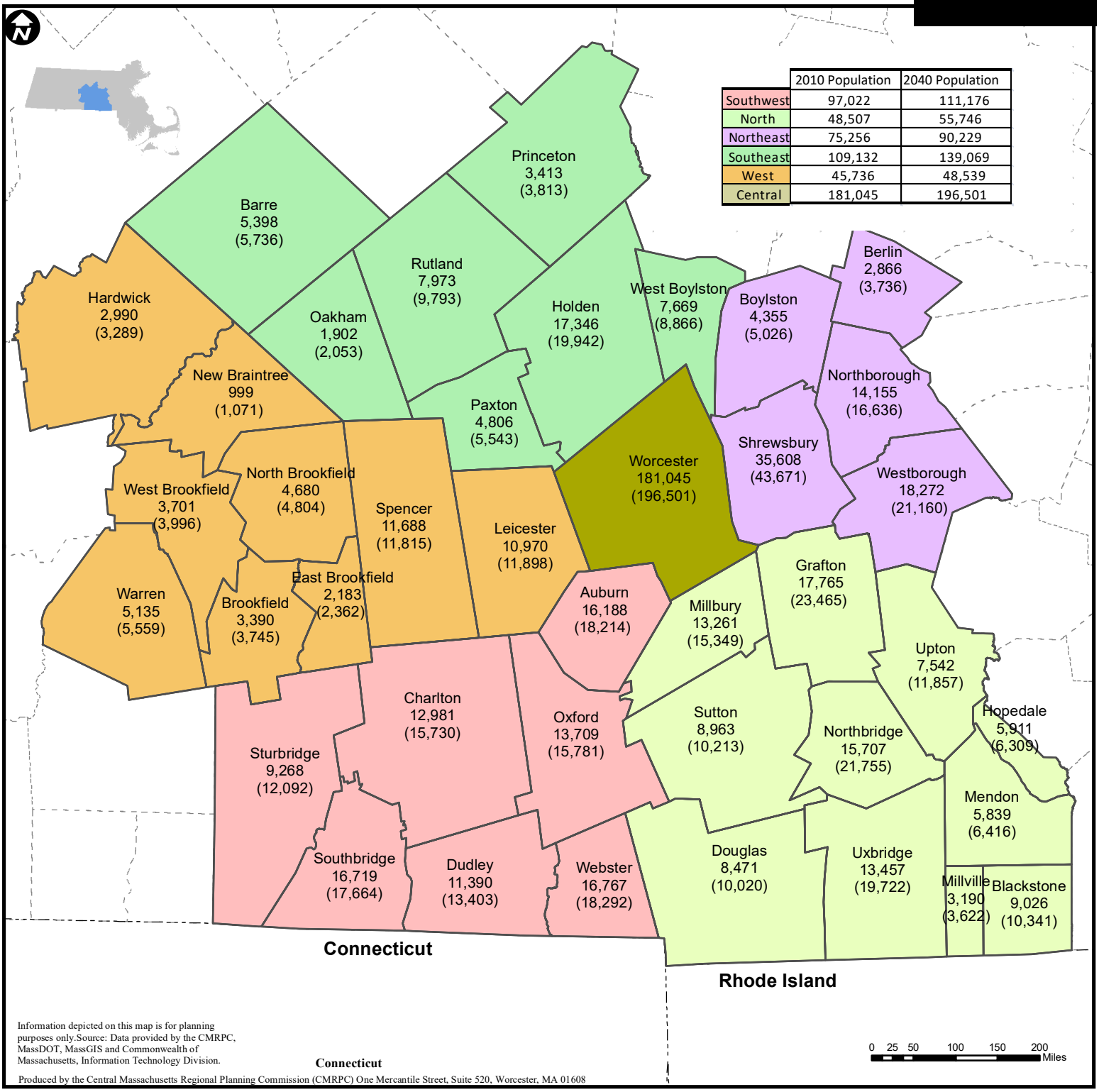

Figure I-2 2010 Population and Projected 2040 Population

Subregion

CENTRAL
NORTH
NORTHEAST
SOUTHEAST
WEST

X,XXX - 2010 Population
SOUTHWEST (X,XXX) - Projected 2040 Population

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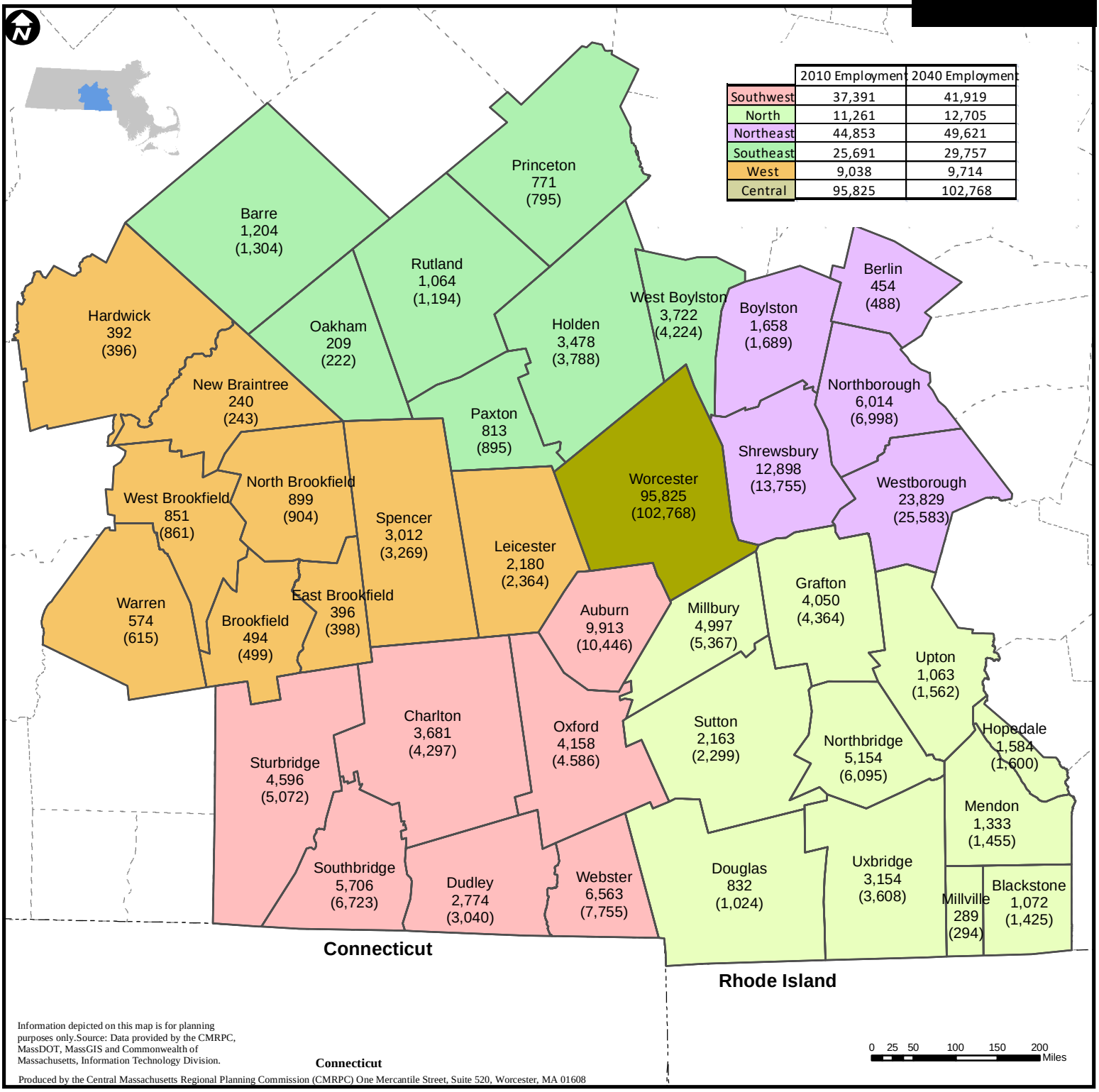


Figure I-3 2010 Employment and Projected 2040 Employment

Subregion

CENTRAL
NORTH
NORTHEAST
SOUTHEAST
SOUTHWEST
WEST

X,XXX - 2010 Employment
(X,XXX) - Projected 2040 Employment

CENTRAL MASSACHUSETTS Regional Planning Commission

Mobility 2040 Invest in Your Transportation Future
The Update for 2020

Public Outreach

Overview

The Fixing America's Surface Transportation Act (FAST Act), the current transportation enabling regulation, continues to emphasize the importance of public involvement of all sectors and users of the transportation network in the transportation planning process. Moreover, the legislation (23CFR Part 450) requires all metropolitan transportation planning agencies to develop a Public Participation Plan "in consultation with all interested parties." The *CMMPO Public Outreach Program*, or POP for short (endorsed by the CMMPO on March 15, 2017), provides the framework for all public outreach activities performed by the CMMPO during the transportation planning process.

Key requirements of the public participation process are: an all-inclusive decision making process and a proactive public involvement process that provide timely public notice, complete information, full access to decision making and support early consultation in the development of metropolitan transportation plans and transportation improvement programs.

The long range transportation plan is updated every four years and requires a major outreach effort. Based on past experiences and key requirements, three focus areas were identified as the foundation for the outreach exercise: priorities on transportation improvements from the "users" perspective, support the performance management system in the decision-making process and achieve a meaningful involvement of vulnerable populations. As such, the outreach effort was guided by the following questions:

1. How transportation priorities had changed through time?
2. How these priorities validate / justify / correlate to the targets included in the regional performance management system?
3. How the vulnerable populations were involved / considered in the process?

By approaching the outreach process as a continuation of previous efforts, the CMMPO was able to reproduce methodologies that were successful in the past. One of these methodologies is the use of surveys which are targeted to identify the needs and priorities of stakeholders, organizations, cities and towns, as well as the general public from all six CMMPO sub-regions.

Moreover, the introduction of performance measures in the transportation planning process has reframed the way federal emphasis areas are taken into consideration during the transportation planning process. Currently, performance measures represent a pillar on the decision-making process, hence reflect the needs and priorities of the region.

The meaningful involvement from vulnerable populations was a key element throughout the outreach process. The CMMPO made an effort to identify non-traditional stakeholders based on the regional demographics and characteristics as identified on the CMMPO Environmental Justice and Vulnerable Population thresholds. An initial approach was done in person and worked with the organizations to find the best suitable format to engage with the population they represent. As a result, in some cases staff attended ESL classes, community meetings, committee meetings, or set tables at their offices on high-foot-traffic days (individuals needed to pay their housing rent). In the same fashion, the presentation was modified as needed and materials were distributed in different languages based on participants' first language.

In order to achieve the desired outcomes from the public outreach in a short period of 3 months, three main work areas were identified and staff was assigned to the tasks associated with each work area. The main work areas for this effort were access to information, promotion and engagement opportunities with the public. At least 15% of the time was used to develop informational materials; 35% of the time was spent promoting meetings, events and surveys, curating contents for posts in social media, distributing brochures; and, the bulk of the work was placed on the engagement opportunities. A brief description of the work performed is included below. For detailed information, please refer to the Technical Appendix – CMMPO Mobility2040: The Update for 2020 Public Outreach Report.

As in the past, the CMMPO relied on the CMRPC website as the major outlet for information. The website included an informational video posted in YouTube as part of the current Mobility2040 plan. In addition to this, posters, brochures and table displays were also produced to be used at meetings and events as informational tools.

The promotion of the planning process required multiple points of communication. Community bulletin boards, flyers, social media (Facebook and Twitter), posts in cable access TV, major circulation newspapers as well as regional outlets and newsletters were several of the tools used to promote the opportunities to participate in the planning process and to provide comments. During this period it was fundamental to have significant content to be posted and shared on social media. The result was the development of the "Project Highlights" posts every Monday and the "Data Tuesdays" posts. This practice allowed the CMMPO to portrait the different work areas and the data sets that are used in the development of the Mobility2040 plan. Monday's "Project Highlights", especially those related to major infrastructure projects, were among the most shared and liked in Facebook. These posts generated all sorts of comments related to the transportation projects included in the current Mobility2040.

Brochures were designed as a tool to disseminate information at events and also as a starter of one-on-one conversations. They were also used to collect people's comments about their priorities by including the following question: How would you like your transportation dollars spent? Respondents needed to choose their top 3 priorities based on a list of 12 emphasis areas that are reflective of the CMMPO performance management system.

The brochure was translated in the top 5 languages (based on the region's LEP Safe Harbor thresholds, 5% or more than 1,000 people that speaks a language other than English and don't speak English very well): Spanish, Vietnamese, Portuguese, Chinese and Swahili. The distribution of the brochures and the survey boxes to every single Town Hall in the region in addition to senior centers and or libraries was based on the CMMPO Environmental Justice and Vulnerable Population regional thresholds. In addition to this, a second threshold was applied: at least 100 people that speaks a language other than English and don't speak English very well. The threshold was applied on each of the 40 communities within the CMMPO region to determine which languages should be available on each location. Communities like Shrewsbury and Worcester had all languages available on their survey boxes. By applying the second threshold, several clusters of LEP population that speaks other languages not reflected on the regional averages, like Albanian, Polish, Arabic, and Gujarati. It represents an opportunity to cater to this population in the future, specifically on the towns where they are clustered.

The distribution of the brochures and the survey boxes was promoted on social media. Brochures were available at events, meetings and presentations, and a copy in pdf format was available in the website in all the top 5 languages. A map with the 100 locations and the languages available in each location was also posted on the website.

The public engagement required to create a consistent image and voice throughout the outreach process. For this purpose multiple tools were developed: guidance materials for staff to use in structured interviews with stakeholders, templates for minutes, sign-in sheets, accessibility checklists to assess meeting locations and presentations. The materials were always available in a "ready-to-go" box with meeting materials. Each staff had to submit a list of the stakeholders that were related to the program areas they were working on. Once the list was completed it was up to each staff to set-up the most suitable meeting format with their stakeholders based on the guidance provided.

As a result, the twenty-five (25) meetings with a myriad representation of stakeholders were completed, at least one public meeting was held on each sub-region, presence and participation on twelve (12) CMRPC events, and set-up tables at nine (9) different venues and events. A summary of these activities are included below.

Traditional Stakeholders:

1. Central Massachusetts Metropolitan Planning Organization – Monthly meetings: 8/15/18, 9/19/18, 10/17/18, 11/28/18, 12/19/18, 1/16/19, 2/20/19, 3/20/19, 4/17/19, 5/15/19, 6/19/19, 7/17/19
2. Central Massachusetts Metropolitan Planning Organization Advisory Committee – 9/26/18, 10/24,18, 1/23/19, 2/27/19, 3/27/19, 4/24/19, 5/22/19, 6/26/19, 7/24/19
3. CMRPC Commissioners – November 8, 2018
4. MassDOT District Office – August 16, 2018
5. I-495 MetroWest Partnership – November 27, 2018
6. Worcester Regional Transit Authority – November 7, 2018
7. TPAG – September 19, 2018
8. WalkBike Worcester – October 18, 2018
9. Conservation Law Foundation – November 14, 2018
10. MassAudubon – November 14, 2018
11. Town Managers / Administrators – September 18, 2018
12. Town Planners – August 14, 2018
13. Division of Public Works Personnel – October 18, 2018
14. Massachusetts Department of Conservation and Recreation (DCR) – March 26, 2019
15. Rail and Freight stakeholders
    a. Boxcar Services, West Brookfield – October 3, 2018
    b. New England Automotive Gateway, East Brookfield & Spencer Railroad – October 24, 2018

Non-traditional stakeholders:

1. Main South Community Development Corporation
    a. Presentation at two community meetings at the YMCA Central Branch in Worcester on Thursday, October 11, 2018 and Thursday, November 8, 2018 at 6:00 PM
    b. Table at their main office on November 1, 2018 (high foot-traffic day due to people paying their rents that day)
    c. Meeting with MassDevelopment TDI Fellow at CMRPC office on Monday, October 3, 2018
2. Green Hill Neighborhood Association
    a. Presentation at their community meeting on Monday, October 29, 2018 at the St. Bernard's Church at 6:00 PM
    b. Representatives from the Channing House, the Linda Fay Griffin House and the Green Hill Towers Senior Housing.
3. African Community Education
    a. Initial meeting at the ACE main office in the Denholm Building on Tuesday, October 16, 2018

   b. Presentation at their ESL Class for parents at the Claremont Academy on Saturday, December 8, 2018 at 1:00 PM
   c. Meeting materials were adapted for an active participation at the ESL class. The group was divided in two: French speakers and Swahili speakers.
4. Worcester Community Connections Coalition (Family Needs Committee)
   a. Presentation to their Family Needs Committee Meeting on Tuesday, November 20, 2018 at 5:00PM.
   b. A survey box with brochures in all languages was available at their offices.
5. Coalition for a Healthy Greater Worcester County
   a. Meeting with the CHGWC Director at CMRPC offices
   b. Table at the presentation of the Community Health Improvement Plan at the Boys and Girls Club of Worcester on Thursday, November 29, 2018 at 8:30 AM
   c. Published information about the plan on their e-newsletter
6. Blackstone Valley Chamber of Commerce
   a. Attended their Open for Breakfast Event in Mendon on Wednesday, October 3, 2018 at 8:30 AM
   b. Presentation at the BVCC Conference Room at the Linwood Mills in Northbridge on Tuesday, October 30, 2018 at 5:00 PM
   c. Published information about the plan on their e-newsletter
7. Southeast Asian Coalition
   a. Meeting with the Program Coordinator at SEAC main office in the Denholm Building on Tuesday, October 16, 2018
   b. A survey box with brochures in Vietnamese was available at their offices.
8. WRTA Riders Advisory Committee
   a. Presentation on Thursday, October 4, 2018 at 5:00PM on the WRTA Hub Conference Room.
9. Veteran's Inc.
   a. Presentation at their community meeting at the headquarters in Grove Street on November 8, 2018 at 6:00 PM.
10. MassHire
   a. Meeting with MassHire Executive Director at CMRPC office on Wednesday, November 7, 2018 at 2:00 PM
11. Centro
   a. Meeting with Centro's Director of Elders Program on Wednesday, October 24, 2018 at their main offices in Syracuse Street.
   b. A survey box with brochures in Spanish was available at their offices.

Sub-regional Meetings

In an effort to reach out to all the communities within the CMMPO region, a meeting was scheduled in each of the CMMPO six sub-regions. With various levels of attendance, the

meetings main goal was to formally present the Mobility2040 transportation plan. An open discussion session was included at the end of the presentation. The meetings were held in the following dates and locations:

1. Central Sub-region: Worcester Senior Center – October 17, 2018, 9:00 AM
2. Northeast Sub-region: Northborough Senior Center – October 23, 2018, 5:00 PM
3. Southwest Sub-region: Southbridge, Jacob Edwards Library – October 25, 2018, 5:30 PM
4. North Sub-region: Barre, Quabbin Regional School District Building – October 29, 2018, 5:00 PM
5. Southeast Sub-region: Northbridge, Linwood Mills – October 30, 2018, 5:00 PM
6. West Sub-region: Spencer Town Hall – November 13, 2018, 5:00 PM

CMRPC Scheduled Meetings and Events

The Mobility2040 outreach efforts were augmented by working in collaboration with other divisions within CMRPC and attending their scheduled meetings and events. At these, staff was able to present the Mobility2040 efforts and get comments from attendees. In other instances, surveys and brochures were distributed.

1. CMRPC Planners Forum at CMRPC Conference Room – August 14, 2018
2. CMRPC at the Worcester Commons, Worcester – August 16, 2018
3. CMRPC Quarterly Commission Meeting in Holden – September 13, 2018
4. MORE: Managers Meeting at CMRPC Conference Room – September 18, 2018
5. Municipal Vulnerability Preparedness Workshop at Uxbridge – September 25, 2018
6. Open for Business Breakfast at Mendon – October 3, 2018
7. Worcester County DPW Forum at West Boylston – October 18, 2018
8. CMRPC meeting with MassHire, CMRPC Conference Room – November 8, 2018
9. CMRPC Quarterly Commission Meeting in Leicester – November 8, 2018
10. Local Mitigation Planning Workshop, Worcester – November 14, 2018
11. Economic Development Committee Meeting, Leicester – November 15, 2018
12. CMRPC Legislative Affairs Committee Breakfast, Webster – December 7, 2018
13. Environmental Consultation Session – April 17, 2019

Tables

Setting up tables at different venues and events provided an opportunity for on-on-one interactions.

1. CMRPC at the Commons, Worcester – August 16, 2018
2. MassDOT Kelley Square Public Workshop, Worcester – October 10 and October 24, 2018
3. Main South CDC Office – November 1, 2018
4. WRTA Transit Hub, Worcester – November 5, 6, 7 and 8, 2018
5. Worcester County Highway Association Meeting, Leominster – November 6, 2018

6. Union Station, Worcester – November 7, 2018
7. Worcester Research Bureau, Worcester – November 27, 2018
8. Coalition for a Healthy Greater Worcester, Worcester – November 29, 2018
9. CMRPC Legislative Affairs Breakfast in Webster – December 7, 2018

Outreach Results

Multiple formats were used to get feedback from the public. The results included herein include the survey results and comments received during the multiple public meetings and interviews with stakeholders. Overall, the input received; and the findings from the Data Management Systems, are the backbone of the priorities identified as part of this long range transportation plan effort. Priorities were also validated by the public during the Environmental Consultation Session, in which the public were invited to choose their top three priorities after being presented a list of the region's needs as identified during the outreach process. These priorities were taken into consideration during the elaboration of Chapter 6. Moreover, the input received during the outreach process, became the foundation for the new developed programs.

A summary of the results from the surveys, comments from the public meetings and priorities are included below. For a detailed list of comments received and minutes from the meetings, please refer to the *Technical Appendix*.

Survey Results

Overall, major areas like roadway maintenance, safety and congestion were top concerns that aligns with the current endorsed PM1, PM2 and PM3 performance measures. But, when comparing the surveys with those from previous years a new emphasis was placed in pedestrian safety and sidewalk condition, concurrently with transit improvements and reliability. It represents a clear message to include transit and accommodations for pedestrians as priority areas in the current performance management system. In addition, stormwater management and emergency management were also frequently mentioned as areas that entail more attention.

A total of 203 "one-question" surveys were completed. These surveys were available only on the brochures. The question: "How would you like your transportation dollars spent?" was primarily focused on the top priorities. The top five priorities were: roadway maintenance (23.0%), safety (13.6%), transit network (12.7%), congestion (11.8%) and pedestrian network (10.1%).

The "long" survey was available online and in paper formats at events and meetings. The survey was translated to Spanish. A total of 588 surveys were completed, with 12 of these in Spanish.

The surveys were answered by individuals living in almost every single town in the region. Respondents living in Worcester had the highest proportion (31.9%).

In terms of the age of the respondents, 29.2% were in the 46 to 60 years age bracket, while 21.7% were in the 36 to 45 years age bracket. About one-quart of the respondents were 61 and over, 25.3% proportion of all respondents. The younger respondents (35 years of age or younger) represent a 23.8% of all respondents.

The survey included a question related to the transportation issues faced on their communities. Roadway maintenance was most frequently on the top of the list in 3 sub-regions (North, Southeast, West; congestion was the top issue on the Northeast and Southwest sub-regions, whereas transit network was the top issue mentioned on the Central sub-region.

Priorities were also included in the long survey. Similar to the short survey, roadway maintenance was the top priority (24.1%), followed by transit network (15.6%), congestion (13.9%), pedestrian network (12.0%) and safety (8.4%). The only sub-region with transit as its top priority was the Central sub-region, 33.3% of respondents. Transit was the second priority on the West sub-region (10.0%), Southeast sub-region (17.5%), Northeast (23.3%) and North sub-region (20.0%). Most of these communities they have very limited transit service, or none at all.

Roadway maintenance was again the top priority followed by transit improvements as the second priority, when analyzing the priorities by age; except for the 33.3% of the 19 to 25 age bracket that mentioned improvements to the transit network as their top priority and the only priority for those 18 and under. Improvements to the bicycle network was also a top priority for the respondents in the 19 to 25 years age bracket (12.5%).

A new access to essential services section was added this year to the survey, primarily to know more about the access challenges people face in their daily routine that are related to transportation. A great majority of the survey respondents rely on their cars to access many locations during the day. Respondents use primarily a car to access their jobs (71.8%), but 14.4% use the WRTA bus service and 4.9% walk to their employment site. A few (1.8%) mentioned they use some type of transportation provided by the employer (shuttles, company car, paratransit, etc.) Others (2.8%) relied on car-pooling to go to work.

The same appears to be the case accessing healthcare facilities. A big proportion rely on car (73.7%), whereas a 13.9% use the WRTA bus service and only 4% walk. Paratransit was mentioned to access healthcare facilities and social services, 2.5% and 3.0%, respectively.

Related with paratransit, some people mentioned they have the service but they don't use it and prefer to rely on family and friends to do the trip to the medical facilities, whereas others don't have the service and will like to have it or see the WRTA paratransit service area expanded. Besides regular paratransit provided by MART and the WRTA, some health institutions or plans also provide transportation services to their patients. Some the providers mentioned were: Fallon Medical, United Healthcare, Tufts Unity, Respite. Conversations with stakeholders from social service organizations (Centro, SEAC) reveals their desire to provide transportation to the population they serve so they can access their programs regularly. Others, like the WCCC provides free monthly transit passes or taxi vouchers for those that go to their programs.

Students use different modes to go to school or college. While 37.7% drive to school, 24.6% use the WRTA bus service and 21.7% walk. Walking was a frequent alternative in the Central sub-region (Worcester), but region wide, improvements to the sidewalks, curb ramps and crossings were among the top factor that will encourage people to walk more often. Safety, night lighting and snow clearance were among the top factors that will increase the chances of more people walking and accessing different locations.

Biking was mainly mentioned for recreational purposes, primarily used in parks or other recreational areas. Region wide, people will like to see separated or buffered lanes as a major factor to encourage them to bike more often. Expanding the bicycle network, either on-road or off-road were also some of the factors most frequently mentioned.

The survey responses clearly indicate a need for more transit service. Even though some respondents indicated that they will keep using their cars and are not interested in any type of mode shift, it was significant the amount of respondents that mentioned they needed more frequent service (19.5%), longer service hours (12.8%), more weekend service (13.0%) and new service in communities in those communities where there's no transit service at all (17.0%). Reliability of the service was a determent for many (11.8%) and other (6.5%) will like to see more training opportunities on how to navigate the bus system.

The long survey also asked for the projects that was most important transportation project needed in the respondent's communities. A list is provided below.

1. Kelley Square and Exit 13
2. I-395, Exit 2 interchange with Gore Road, Route 16
3. I-495, interchange with MassPike (I-90)
4. I-495 interchange with I-290
5. Rail connections around I-495

6. Dudley: Route 31, intersection with Route 197, Schofield Ave and W. Main Street
7. Spencer: Route 9 intersection with Route 49
8. Sutton: Reconstruction of the Central Turnpike
9. Uxbridge: Route 122
10. Ware: Improvements in Route 9
11. Pedestrian safety on Route 9 and Route 67
12. Sidewalks on Route 9
13. Widening Route 20
14. Widening Route 140
15. Bridge replacement on St. Paul Street (over the Blackstone River)
16. MassPike (I-90) exit in Warren, Route 67
17. Ramps from Route 146 to I-290 West
18. Repair road signs
19. Commuter rail from Worcester to Providence, with connections to the intracity bus
20. Commuter rail from Boston to Springfield, with connections in Worcester
21. Expand commuter rail to Clinton.

Public comments

A major aspect of the public outreach is to get the feedback and then circle back with potential action items to address the feedback received. Most of the comments were divided between maintenance, pavement condition, congestion, issues with traffic signals (timings, coordination, etc) or dangerous intersections and transit, whether is the service reliability, fare increases, more service, route extensions or overall operations of the service. A key aspect was information. People wanted information about delays, detours, closings due to construction; they want to be informed in advance to be able to make the necessary arrangements.

The need for transportation geared to target audiences was a key aspect that was continually mentioned. Among some of these was transportation for veterans, workforce related transportation or for the elderly. Paratransit service and the lack of it and the hardship that the elderly population go thru in their daily lives due to a lack of transportation service was heavily mentioned throughout the outreach process. Veterans asked for a reduced fare and late night service to accommodate late shift hours.

Besides the transit-related complaints, there were multiple suggestions to improve the service. As for example, there were suggestions to have in-bus announcements in other languages, or printed schedules in multiple languages with places to go, including parks and other recreational areas. They also want to see schedules and pas of the service in the bus shelters and bus stops. One participant recommended the creation of Transit Ambassadors, who will support the Travel Trainer when they are offering travel trainings for refugees. The

Ambassador will be a former refugee or a person from the same country as the trainee and will help welcome and support the new trainee as part of their process of settling down in a new city. Another suggestion is to use the transit pass to pay for the bike-sharing, or fare integration between the two modes.

Another major topic that was brought up in the meetings was non-motorized transportation. Connection to the trail system in the region was highly mentioned, like connectivity from the Wachuset Trailhead to Barre Town Center, connectivity issues in the Southern New England Trunkline (SNETT), connectivity to the Mid-State Trail from Spencer's Main Street, improvements to the Grand Trunk Trail in Sturbridge, and completion of planned Blackstone River Greenway's trail segments.

Some people were concerned about the bike sharing programs, but there seems to have consensus in the need for more accommodations for pedestrians and bicyclists with safer infrastructure. Protected bike lanes were heavily mentioned as something that could improve bicyclists' safety during the elaboration of the CMRPC Bike Plan and it was validated during the long range transportation plan outreach process. There was a request to increase the funds related with Complete Streets since it has become a great program for the communities in the CMMPO region to provide the required infrastructure for non-motorists and fill the gaps related with sidewalks and accessibility to essential services.

Prioritization Exercise

On April 17, 2019, the CMMPO held a public meeting to share with the public the needs identified during the development of the long range transportation plan. They were invited to prioritize a list of projects or tasks organized by Programs. Their priorities were then aggregated to the CMMPO Priorities. The CMMPO prioritizes transportation projects by relying on several sources: Major Infrastructure Projects, Data Management Systems, the Public Outreach, and priorities by topic areas. Given the financial constraints, prioritization plays a key aspect of the LRTP process. It was mentioned that some of the priorities could be addressed under the CMMPO programmatic areas, whereas others will require a transportation improvement project. A flip chart was provided as a tool to record other needs and comments. In summary, the major takeaway from this meeting is that people's major priority is connectivity, either with trails to schools, or rail service to other areas outside the CMMPO region, or more parking at commuter rail stations. As mentioned before, these priorities are included in Chapter 6.

Title VI, Linguistically Isolated & Environmental Justice Populations

Policy Background

There are laws, regulations and requirements to guarantee that all government entities operate their programs, services and activities in full compliance with federal nondiscrimination laws, including Title VI of the Civil Rights Act of 1964, the Civil Rights Restoration Act of 1987, Executive Order 13166, "Improving Access to Services for Persons with Limited English Proficiency" (LEP), Executive Order 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations”, U.S. DOT policy and guidelines and state regulations including the Massachusetts Public Accommodation Law.

Title VI prohibits discrimination in federally assisted programs and requires that no person in the United States of America shall, on the grounds of race, color, or national origin, including limited English proficiency (LEP), be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity receiving federal assistance. The Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) regulations expand Title VI to prohibit discrimination on the basis of age, sex, and disability. In addition, the Massachusetts Public Accommodation Law prohibits making any distinction, discrimination, or restriction in admission to or treatment in a place of public accommodation based on race, color, religious creed, national origin, sex, sexual orientation, disability, or ancestry.

The CMMPO Title VI Program provides for continuous monitoring of potential and/or unintentional discrimination among its region’s Title VI populations as a result of its policies, programs and activities. The CMMPO members and staff are continuously trained in Title VI, LEP and Environmental Justice topics using USDOT and MassDOT Title VI Program guidance. The CMMPO also submits annual reports to MassDOT summarizing its Title VI activities throughout the year, and submits a Title VI Plan to FTA every three years in coordination with FHWA/FTA Certification Reviews.

The CMMPO also administers an Environmental Justice (EJ) Program to identify and address disproportionately high and adverse human health and environmental impacts that its policies, programs and activities could have upon the region’s minority and low-income populations. It screens transportation projects with these factors in mind and tailors its public outreach to include those more vulnerable within the region. Furthermore, the demographic characteristics

of the region demands multi-cultural awareness in the CMMPO work, whether it is with the provision of materials and information in diverse languages or meeting formats and accommodations.

Accomplishments

The CMMPO has been repeatedly in compliance with federal and state regulations and is fully committed to address the needs of all in the Central Massachusetts region. In 2017, the CMMPO received a "good standing" approval from the Federal Certification Review of its programs, services and activities. CMMPO Title VI recent work include the updated versions of the Notice to Beneficiaries, Complaint Procedures and Complaint Forms. Also, the CMRPC website was updated and the documents are readily accessible to download either in word or in PDF formats.

Among other documents produced by the CMMPO are: the "CMMPO Title VI, Environmental Justice and Limited English Proficiency (LEP) Guidance to Communities" which provides information about Title VI and EJ to all TIP project proponents, the "CMMPO Meeting and Event Accessibility Checklist" to determine if a location is accessible, the "Language Services and Accommodations Reference Guide" that includes services and vendors available to the CMMPO if a reasonable accommodation is requested, and the creation of "I Speak" cards posted at the CMRPC offices and conference rooms. The CMMPO also updated the Public Outreach Plan (POP) and the LEP Plan. Both documents are also available to download on the website.

Furthermore, the CMMPO submitted Title VI reports (annual and triennial reports, among others), and supported the WRTA in their compliance with Title VI regulations by updating the 2015 Title VI Plan with 2011-2015 American Community Survey (ACS) data, provided a list of fare changes and major service reductions, completed the Limited English Proficiency Analysis for the WRTA Language Assistance Plan, and was in charge of all the public outreach related to the service changes, including 13 publics meetings in locations within the WRTA Service Area. The CMMPO also assists the WRTA in providing Title VI information and procedures to its bus riders through flyers, "car cards" and public meetings. Also, offers continue support in transit planning activities and Title VI provisions throughout the planning process.

Moreover, in order to facilitate the implementation of the 3C process and to expand citizens' involvement in CMMPO functions, a CMMPO Advisory Committee was established. The Advisory Committee provides a forum for broad public participation, technical and citizen input in the transportation planning process. It brings together public agencies, elected and

appointed officials, transportation providers, environmental interests, technical experts, specialists, business persons and citizens concerned with transportation plans and programs.

The CMMPO has historically made a concerted effort to involve the region's disabled, elderly, low-income and minority populations. A number of advocacy groups serving these populations are included on the TPAG Elderly and Disabled Technical Task Force. These advocacy groups distribute information and materials to their associates, including local community organizations. Recently, the CMMPO has been working to address the region's needs through the Regional Coordinating Council.

The CMMPO Environmental Justice (EJ) definition is founded in the region's characteristics and is updated every five years. The primary source is the American Community Survey five-year Estimates by U.S. Census Block Groups. The EJ definition consist of the thresholds for minority population and low income population. In 2010, the region's proportion of minority population was 20.3%. The region's proportion of minority population increased to 22.2% in 2015. Any block group with a proportion equal or higher than 22.2% is then considered an EJ block group. Related to the low income criteria, if the median household income within a block group is 65% less than the regional median household income, then the block group is considered an EJ block group. In 2010 the low income threshold was $50,259 ($42,147 in today's dollars). The threshold in 2015 is $44,901.

Besides considering minority and low income populations, the CMMPO added other criteria recognizing those who are the most vulnerable and tailored the thresholds based on the region's characteristics. The CMMPO vulnerable populations (VP) include the elderly population, or the population 75 years of age or older, the households with no car available and the linguistically isolated households. Data from the 2015 ACS 5-Year estimates shows that 9.0% of the region's households don't have a vehicle available, 6.2% of the region's population is 75 years or older and 8.4% of the population 5 years and over are linguistically isolated, (speaks a language other than English and the English proficiency is less than "very well"). Similar to the EJ definition, a census block group is considered VP if the proportion of any of these criteria is equal or higher than 150% the region's average. The thresholds are consistently applied in the Transportation Improvement Project (TIP) selection process, in transit planning activities and supports the outreach efforts.

The CMMPO outreach to vulnerable populations is the result of identifying and reaching out to organizations that directly work with vulnerable populations. The CMMPO approach is to 'go where people are' and carefully planning public meeting at accessible locations and appropriate times. In the same fashion, documents and materials are translated into nine

languages other than English based on LEP Safe Harbor provisions: Albanian, Arabic, Chinese, French, Polish, Portuguese, Spanish, Swahili, and Vietnamese.

Planning Ahead

Future work on Title VI includes the update of MassDOT's "Engage" tool, including contact list, organization type and category. Also, staff will be trained on how to maximize the capabilities of the tool. Likewise, the Benefits and Burdens Analysis completed in 2012 will be revised and updated to include a cumulative impact analysis.

In accordance with the 2017 CMMPO Certification Review, the CMMPO will prepare an LEP Analysis/Language Implementation Plan update.

The CMMPO will continue supporting the WRTA in their compliance with Title VI requirements, especially on the ongoing transit and paratransit planning. More emphasis will be placed on improving accessibility for those who are the most vulnerable in the region, improving service quality and guaranteeing a fair fare structure. CMMPO staff will work together with the WRTA to identify "transit deserts" in the region in those areas where vulnerable populations and high demand for transit or paratransit service exists.

Outreach to organizations that work with vulnerable populations are paramount. The CMMPO will continue its work towards engaging these organizations throughout the CMMPO activities, either by participating in advisory committees or by addressing their needs and priorities through the CMMPO work.

CHAPTER II

Performance Management

Introduction

Performance-Based Planning and Programming (PBPP) refers to transportation agency's application of performance management in their planning and programming processes. The foundation of PBPP was initially federally-legislated through the Moving Ahead for Progress in the 21st Century (MAP-21) and then reaffirmed in the Fixing America's Surface Transportation Act (FAST Act). These two Acts transforms the federal-aid highway program by establishing new requirements for performance management to ensure the most efficient investment of federal transportation funds that support the seven National Goals:

1. Safety
2. Infrastructure Condition
3. Congestion Reduction
4. System Reliability
5. Freight Movement and Economic Activity
6. Environmental Sustainability
7. Reduced Project Delays

In addition to the federal requirements for Metropolitan Planning Organizations (MPOs) to integrate PBPP into their transportation processes, MPOs are required to adhere to the Continuing, Cooperative, and Comprehensive (3C) Metropolitan Transportation Planning Progress. For MPOs, this includes a range of activities and products that address Ten Planning Emphasis Areas undertaken by a transportation agency together with other agencies, stakeholders and the public. The Ten Planning Emphasis Areas are – Safety, Security, State of Good Repair, Congestion, Multimodal Transportation, Promoting Sustainability, Equity, Economic Vitality and Freight Movement, Stormwater Management &Infrastructure Resiliency and Travel & Tourism. These emphasis areas must be addressed when the CMMPO is developing strategies, projects, plans or initiatives including:

1. Long-Range Transportation Plans (LRTPs)
2. Other plans and processes (including those that are federally required, such as Strategic Highway Safety Plans, Asset Management Plans, the Congestion Management Process
3. Transit Agency Asset Management Plans and Transit Agency Safety Plans as well as others that are not required)
4. Programming documents, including state and metropolitan Transportation Improvement Programs (STIPs and TIPs)

By addressing the planning emphasis areas in all areas of the transportation process, the CMMPO is able to create more balanced and holistic transportation products for the region. Likewise, the goal of PBPP is to ensure that transportation investment decisions—both long-term planning and short-term programming—are based on the ability to meet established goals.

Putting it All Together: Meeting the National Goals

The CMMPO has blended the federal requirements for PBPP and addressing the federal emphasis areas to develop a regionally-customized Performance Management Program that contributes to transportation goals on the regional, state and federal levels. A Performance Management Report Card is distributed to stakeholders annually that explain how the CMMPO is attempting to meet the needs of the region while complying with federal requirements.

In Table II-1 below, is a depiction of the CMMPO's Performance Management Program. The CMMPO has accepted MassDOT's suggestion of developing goals, targets and objectives for each of the ten planning emphasis areas that are listed on the left side of the Figure. In the middle of the figure are six of the seven* National Goals of the United States Department of Transportation. These National Goals are adjacent to related emphasis areas that share the same objectives. The Federal Rules that establish an implementation strategy for specific measures, targets and goals that must be reached between the MPO and state Department of Transportation are located to the right of the figure. Again, these rules are adjacent the related National Goals and emphasis areas. The blank fields in the figure show where there are no Federal Rulings that require MPOs to measure specific data and collaborate on target setting. It is in these areas of Stormwater Management & Infrastructure Resiliency, Travel & Tourism, Equity and Security is where the CMMPO is able to develop locally meaningful performance measures to track progress towards a goal.

Table II-1: CMMPO's Performance Management Program

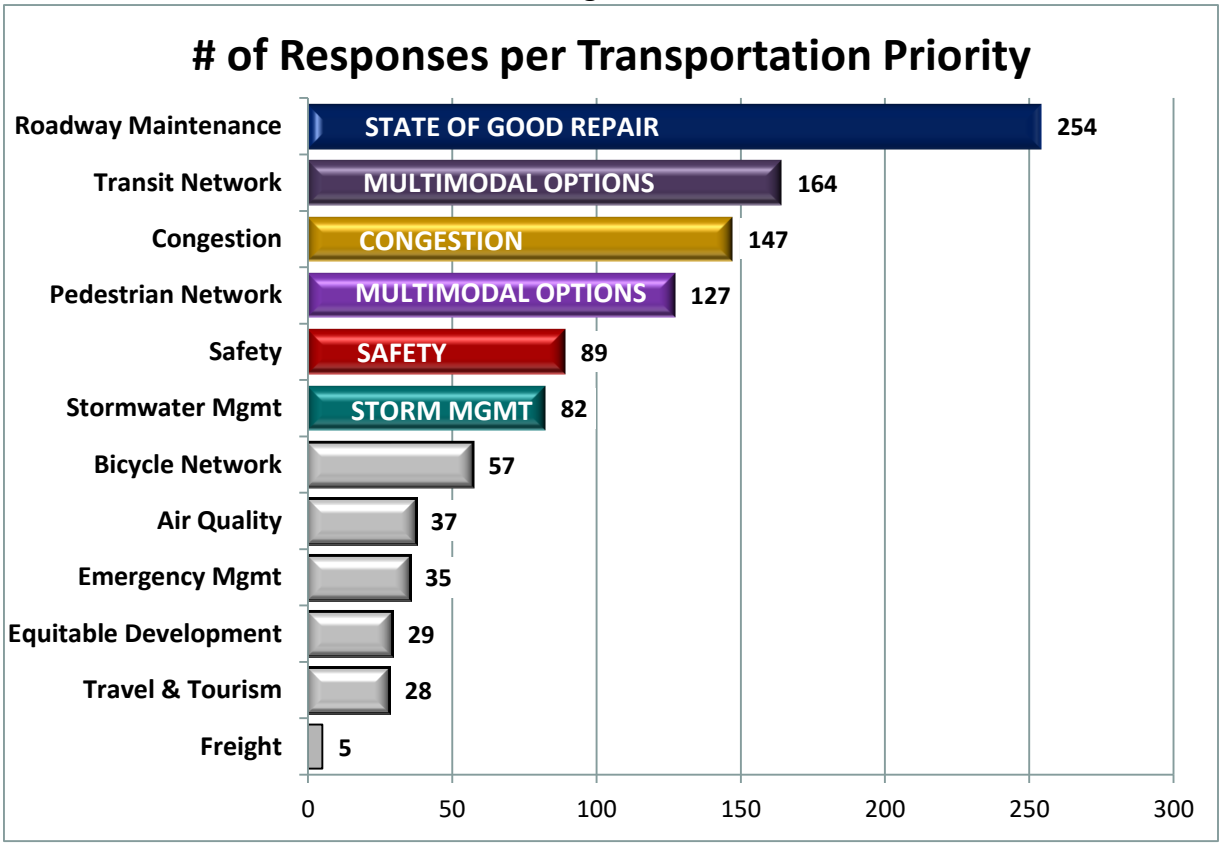
	PLANNING EMPHASIS AREA	US DOT NATIONAL GOAL	FHWA RULE
1	Safety	Safety	PM1: Safety
2	State of Good Repair	Infrastructure Condition	PM2: Pavement & Bridge
3	Congestion	System Reliability	PM3: System Performance, Freight & Air Quality
4	Multimodal Options	Congestion Reduction	
5	Economic Vitality / Freight	Freight Movement & Economic Vitality	
6	Reduce GHG, Sustainability	Environmental Sustainability	
7	Stormwater Management		Locally Derived Measures
8	Travel & Tourism	Locally Derived Measures	
9	Equity	Locally Derived Measures	
10	Security	Locally Derived Measures	

**The seventh National Goal is Reduced Project Delivery Delays. This goal is to eliminate delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices.*

Regional Priorities and Performance

The CMMPO's public outreach process to gather the transportation planning priorities of the region has helped influence the development for developing the regionally customized performance measures. Meeting the specific needs of the region's 40 communities and being able to measure the impact of programmed investments is the core of PBPP. The CMMPO's public outreach for this LRTP update has resulted in a refined list of regional priorities and the following Figure II-2 summarizes the priorities gathered from 367 survey responses and the corresponding performance emphasis area. Identified priorities are on the left of the graph and each bar is labeled with the corresponding national transportation planning emphasis areas.

Figure II-1



The survey priorities will assist in refining the next evolution of the Performance Management Program for calendar year 2019 as well influence any technical assistance programs done with the individual communities. Again, the survey responses support staff's ongoing efforts to address all of the federal transportation planning emphasis areas in a regionally customized manner.

The CMMPO has fully integrated PBPP into every aspect of the transportation process. Each of the transportation modes and linkages in the upcoming chapters will show progress towards the regionally customized performance goals as well as the federal requirements.

Federal Performance Management Rules

The CMMPO, in cooperation with MassDOT, the Worcester Regional Transit Authority and local stakeholders have agreed upon pertinent measures and targets for each of the federal Performance Management Rules. The following is a description of the CMMPO's performance for the federal rules – PM1 Safety, PM2 Pavement and Bridge, PM3 System Performance, Freight and Air Quality, and the Federal Transit Authority (FTA) Transit Asset Management

(TAM) Rule. The CMMPO has voted to support the state's targets for PM1, PM2 and PM3 and those are reflected in this chapter.

Planning Emphasis Area	US DOT National Goal	FHWA Rule
SAFETY	SAFETY	Highway Safety Performance Management (PM1)

Safety Performance Measures Introduction (PM1)

The CMMPO is supportive of the vision to eliminate fatalities and serious injuries on the National Highway System (NHS) by working collaboratively on strategies with local stakeholders, other MPOs and MassDOT. Safety is a top priority on the federal, state and regional levels. The Safety Performance Management Measures (PM1) regulation supports the Highway Safety Improvement Program (HSIP) and requires State Departments of Transportation and MPOs to set HSIP targets for five safety performance measures.

The CMMPO voted to adopt MassDOT's calendar year (CY) 2019 highway safety targets for five federally required highway safety performance measures at a meeting held on February 20, 2019. These safety performance measures are:

1. Number of fatalities
2. Rate of fatalities per 100 million vehicle-miles traveled (VMT)
3. Number of serious injuries
4. Rate of serious injuries per 100 millionVMT
5. Number of non-motorized fatalities and serious injuries

FHWA requires states to submit the five performance targets annually in an HSIP report by August 31st of each year. MPOs are required to establish targets that either support the state targets or alternatively set their own quantifiable targets by February 27th of the calendar year for which the targets apply. Should the MPO decide to set its own targets they would have to submit methodologies and data that supports their targets to the state DOT.

Whereas state DOTs submit their targets to FHWA via the HSIP report, MPOs must present the safety measures and targets in their Long Range Transportation Plan (LRTP) and Transportation Improvement Program (TIP).

Massachusetts Highway Safety Performance Measures CY 2019

FHWA requires five-year rolling averages when setting performance targets. For the target setting year of 2019, targets where compared to the annual rolling averages for 2015-2019.

Targets were developed by estimating safety measure trend values based on linear trend lines that were calculated using 2007-11, 2008-12, 2009-13, 2010-14, 2011-15, and 2012-16 five-year rolling averages. The only target that varies from this methodology is the non-motorized fatalities and serious injuries measure. For this non-motorized fatalities and serious injuries target, Massachusetts used the 2012-16 rolling average value as its CY 2019 target. The following Table II-2 is a list of the statewide rolling averages for each performance measure for 2012-16, along with the CY 2019 targets.

Table II-2: 2019 Massachusetts Statewide Highway Safety Performance Targets

Highway Safety Performance Measure	2016 Safety Measure Value (2012-16 Rolling Average)	2019 Safety Measure Target (Anticipated 2015-19 Rolling Average)
Number of fatalities	364.0	353.0
Rate of fatalities per 100 million VMT	0.610	0.580
Number of serious injuries	3146.0	2801.0
Rate of serious injuries per 100 million VMT	5.240	4.370
Number of non-motorized fatalities and non-motorized serious injuries	540.8	540.8

CMMPO Highway Safety Performance Trends

MassDOT and the CMMPO will continue to work together and strategize planning and programming at the state and MPO levels to support improvements in highway safety outcomes. The CMMPO supports the state's highway safety targets and the following five charts shown in Figure II-2 through Figure II-6 how the CMMPO's Safety Performance Trends are similar to the state's Safety Performance Trends.

Figure II – 2

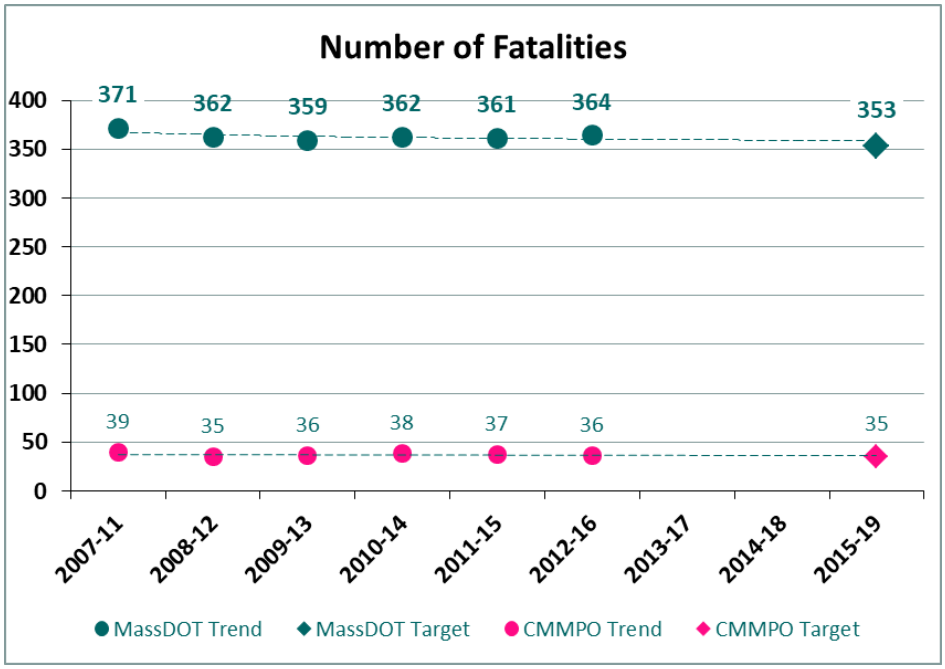


Figure II – 3

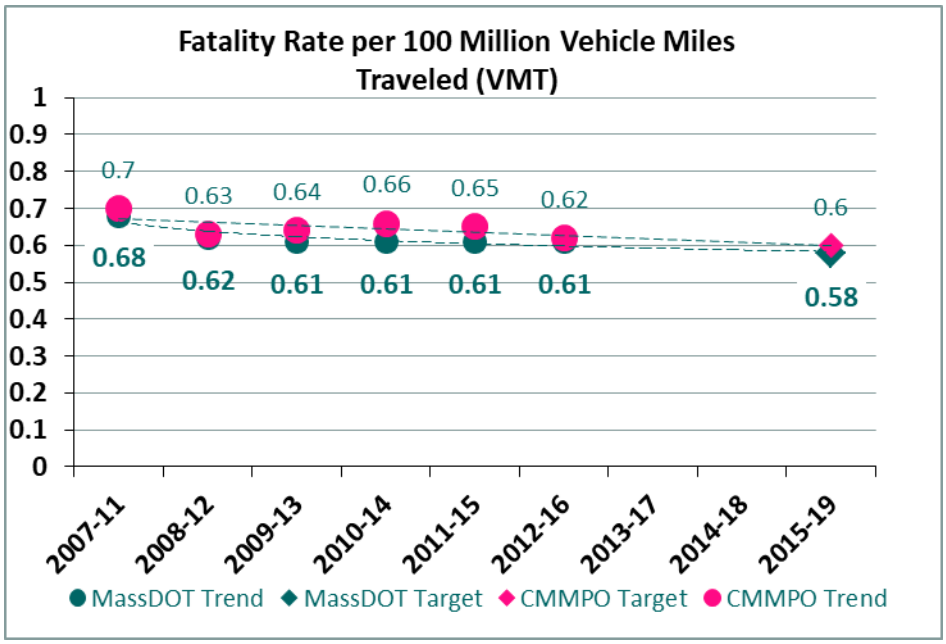


Figure II – 4

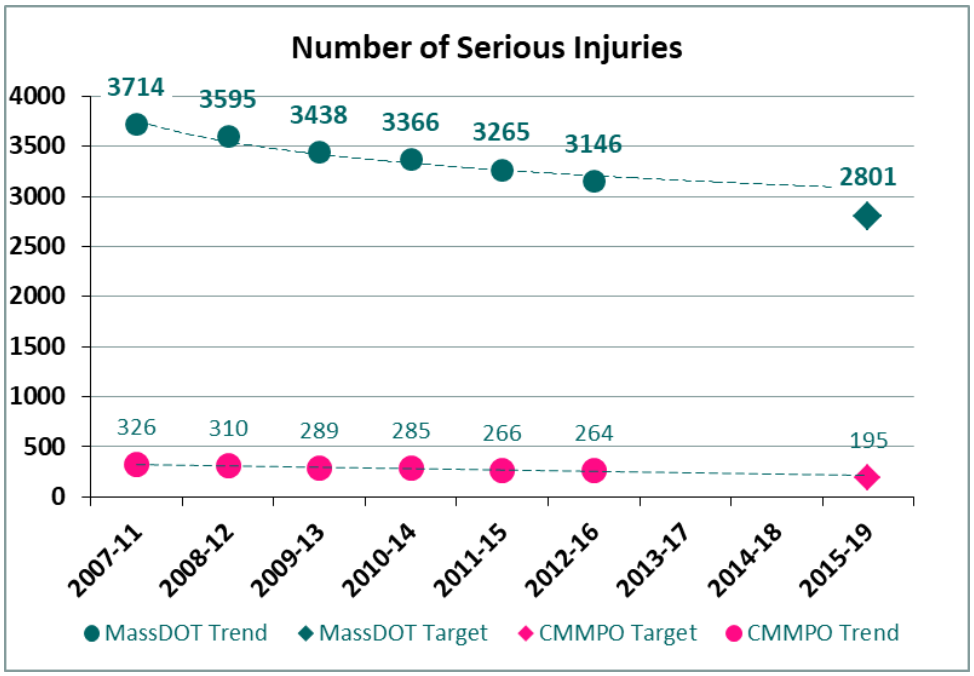


Figure II – 5

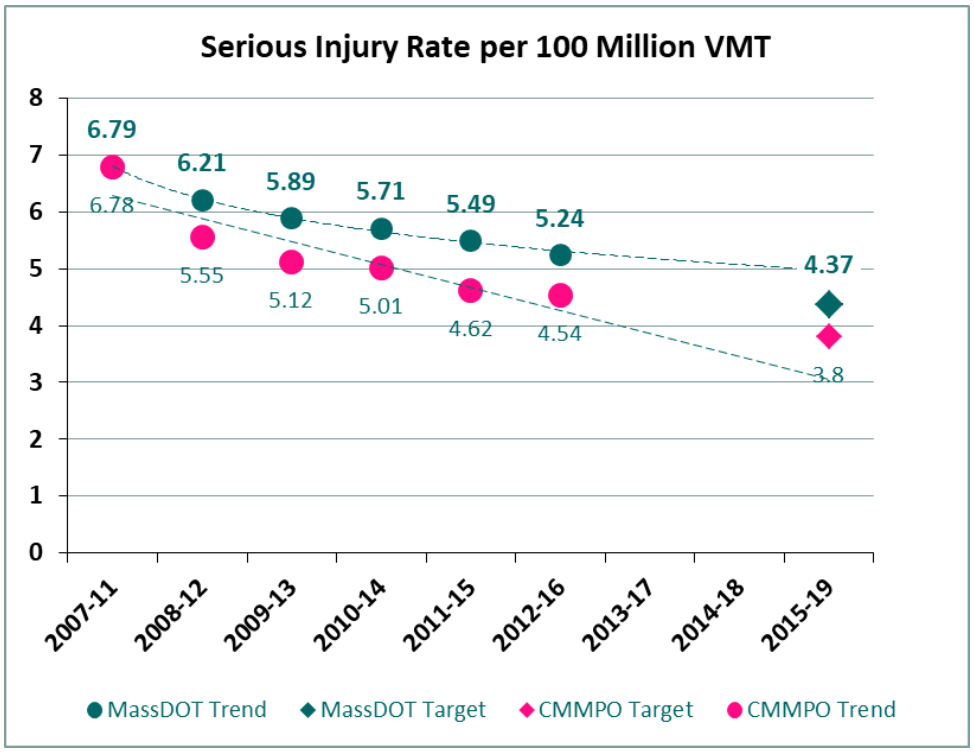
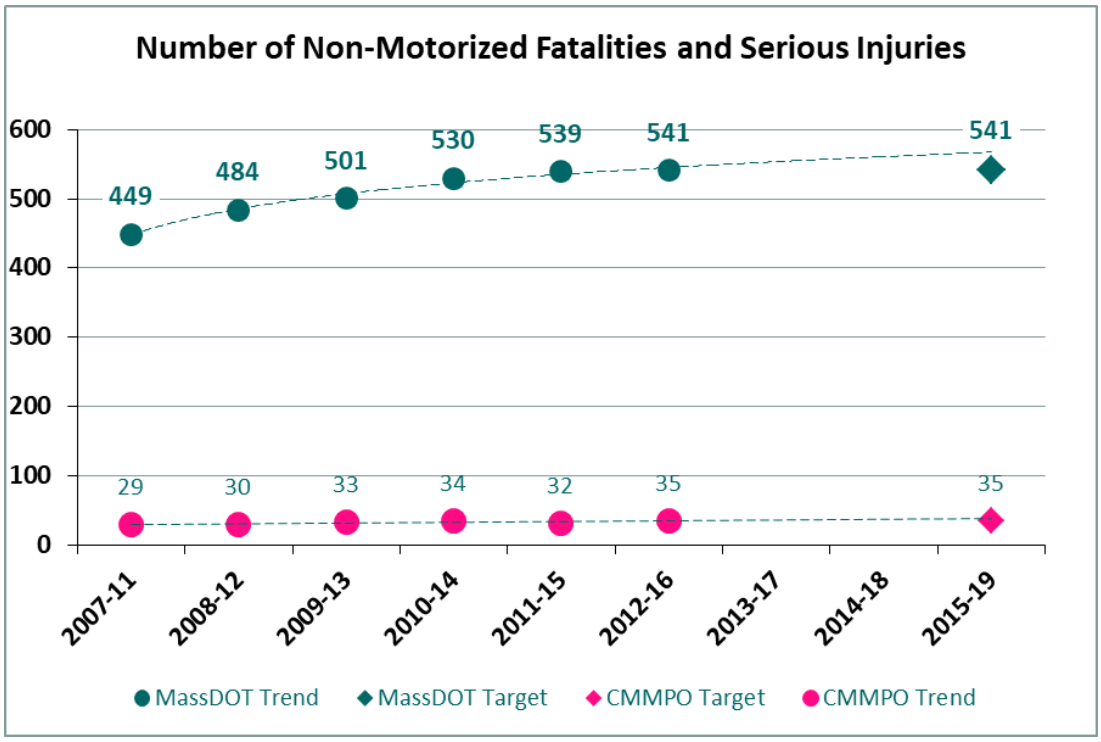


Figure II – 6



CMMPO Highway Safety Performance Result

FHWA guidance indicates to start with a trend line as the target for CY 2019 and then consider external factors and planned implementation in order to set targets for the following performance periods. As previously shown in Figure II-2 through Figure II-6, the CMMPO is anticipated to follow the Highway Safety Performance trend for each measure or improve for CY 2019.

An excerpt of the Highway Safety Performance Result in the Annual Report Card is summarized in Table II - 3 and includes the regionally customized Safety Performance Measure for large trucks and freight. The measures in Table II - 3 that are located in the rose boxes are the federally-required Safety Highway Performance measures and targets developed by MassDOT and adopted by the CMMPO. The measures in the white boxes are specific to the CMMPO region and will be used in the development of the LRTP and other planning documents. The green lights indicate the CMMPO or state is doing well; conversely the red lights indicate poor performance. The unlit or silver lights indicate that measure is not used on the state level.

Table II – 3: CMMPO Highway Safety Performance Results

	MEASURE	PAST STATUS	5-YEAR ROLLING AVERAGE TARGET (2015-2019)	CMMPO TREND	STATE TREND	GOAL
SAFETY	Number of fatalities		35.0 Fatalities			*Reduce number and rate of fatal and serious injury crashes in the region. Move towards Vision Zero Deaths*
	Rate of fatalities per 100 million VMT		0.60 Fatality Rate per 100 million VMT			
	Number of serious injuries		195 Serious Injuries			
	Serious injury rate per 100 million VMT		3.8 Serious Injury Rate per 100 million VMT			
	Number of non-motorized fatalities and serious injuries		35.0 Combined Non-Motorized Fatalities & Serious Injuries			
	Number of large truck and freight crashes (fatal and serious injury)		25.56 combined Fatal & Serious Injury crashes for large trucks/freight			*Reduce number and rate of fatal and serious injury crashes for large trucks/freight by 10% by 2040*
	Rate of fatalities and serious injuries per 100 million VMT for large trucks and freight		0.53 combined Fatal & Serious Injury Crash Rate for large trucks/freight			

Planning Emphasis Area	US DOT National Goal	FHWA Rule
STATE OF GOOD REPAIR	INFRASTRUCTURE CONDITION	Pavement & Bridge (PM2)

State of Good Repair Introduction (PM2)

The CMMPO has been measuring the infrastructure condition of the region's highways, sidewalks, ADA ramps and pavement for a many years. Working with MassDOT, the CMMPO has agreed to support the state's targets for Pavement and Bridge Conditions to comply with FHWA Rule, PM2. This section will include an update on the performance outcome of the regionally-customized measures and the federally required Pavement and Bridge measures.

Bridge and Pavement Performance Measures

The FHWA Rule PM2 is only applicable for bridge and pavement assets on the NHS. State DOTs and MPOs are to establish two and four-year targets starting with CY 2020 for the percentage of asset class in good condition and percent of asset class in poor condition. The amount of NHS pavement miles and bridge deck area under the CMMPO's jurisdiction is minimal. As such, the CMMPO is not responsible for the performance of these assets. Accordingly, the data included in this section is only presented at the statewide level and not compared with the regional level.

NHS Bridge Inventory

- NHS bridges constitute 44% of Massachusetts National Bridge Inventory (NBI) structures, and 70% of the deck area
- As shown in Table II-4, MassDOT is responsible for nearly all of the bridges in the state
- There are only five municipally-owned NHS bridges in the CMMPO region

Table II-4

Distribution of Ownership of NHS Bridges in Massachusetts			
Owner	**By Count**	**By Area (square feet)**	**% of Ownership**
MassDOT	2173	28,560,106	97%
Municipality	73	897,246	3%
Totals	2246	29,457,351	

NHS Bridge Condition Measure

Historically, the primary Highway Division measure for bridge performance has been the number of structurally deficient bridges (SD) within the State. MAP-21 requires that states now report the condition of National Highway System (NHS) bridges by the percentage of deck area on structurally deficient structures compared with deck area of the full system, with a target not to exceed 10% of all deck area.

This measure incorporates structure size in the analysis of bridge performance and uses NBI condition ratings for Deck, Superstructure, Substructure, and Culvert. Condition is determined by the lowest rating of these items. If the lowest rating is greater than or equal to 7, the bridge is classified as good; if it is less than or equal to 4, the bridge is classified as poor.

Figure II - 7 is how the percentage of good and poor bridge conditions is calculated.

Figure II – 7

$$\%\ \text{Good/Poor Bridge Condition} = \frac{\text{Total bridge area in good/poor condition}}{\text{Total bridge area}}$$

NHS Bridge Condition Targets

The bridge condition targets should be determined from asset management analysis and procedures and reflect investment strategies that work toward achieving a state of good repair over the life cycle of assets at minimum practicable cost. State DOTs are required under new regulations to develop an asset management plan which includes statewide conditions of bridges.

Federal regulations state that the Poor condition threshold is 10%. Above that threshold state DOTs must obligate a minimum amount of NHPP funds to on-systems bridges. As shown in the figure below, MassDOT exceeds the threshold and currently programs the minimal amount.

Table II - 5 displays the state's targets for NHS Bridge Condition.

Table II – 5

State Targets for NHS Bridge Condition			
Measure	**Current Condition**	**2020**	**2022**
% Good	15.22	15	16
% Poor	12.37	13	12

Pavement

This rule establishes measures for State DOTs and MPOs to use to carry out the NHPP and to assess progress on achieving condition targets for NHS pavements. StateDOTs and MPOs must use Highway Performance Monitoring System (HPMS) data used by FHWA to calculate good/poor metrics and measures. HPMS data pavement data collection requirements revised to require more comprehensive collection of data for NHS routes.

Statewide NHS Pavement Inventory

- NHS constitutes 16% of state-wide accepted lane mileage
- 73.5% under MassDOT jurisdiction
- 4.4% under municipal jurisdiction
- Remaining owned by DCR, MassPort, Federal
- MassDOT manages capital investment for state-owned portions of the NHS, collects condition data on entire system
- In the CMMPO region, there are 200 NHS lane miles, which makes up 8% of the total NHS lane mileage in the state

Pavement Condition Measures

This rule requires the state to set two and four year targets for the percent of pavements in good and poor conditions on both the Interstate and Non-Interstate NHS. The measure is aggregated by lane miles.

Though based on similar metrics, the federal measure differs from the Pavement Serviceability Index (PSI) used historically by MassDOT:

- Roughly, pavement that is "Good" in the FHWA measure is "Excellent" in PSI
- Some of the "Poor" in PSI is rated "Fair" by the FHWA measure

Non-Interstate NHS targets for first and second performance period (2020 & 2022) will be IRI only, and allow for phased implementation of full distress measure. Table II -6 demonstrates the performance measures for pavement.

Table II – 6

Pavement Condition Measures	
Interstate System	**Non-Interstate NHS**
% of pavements of the Interstate System in **Good** condition	% of pavements of the non-Interstate NHS in **Good** condition
% of pavements of the Interstate System in **Poor** condition	% of pavements of the non-Interstate NHS in **Poor** condition

Pavement Condition Targets

The setting of pavement condition targets for the first performance period is challenging given the lack of historical data for the new measure. MassDOT's approach for all performance measures is to use past indicators for a trend, set conservative targets, and review at the middle of the performance period (2020).

For this first attempt at setting targets for pavement, MassDOT chose conservative targets to account for risks associated with the new measure (single year of data, unknown variability.

The mid performance period at 2020 will provide three years of condition data upon which future targets can more accurately be determined. Table II-7 and Table II-8 show the state targets for pavement.

Table II – 7

State Targets for Interstate Pavement			
Measure	**Current Condition**	**2020**	**2022**
% Good	74.2	70	70
% Poor	0.1	4	4

Table II - 8

State Targets for Non-Interstate NHS Pavement			
Measure	**Current Condition**	**2020**	**2022**
% Good	32.9	30	30
% Poor	31.4	30	30

CMMPO State of Good Repair Result

The following Table II-9 shows the CMMPO's State of Good Repair result. The red lights for the Bridge measures indicate that MassDOT and CMMPO are not moving towards the target. This poor trend could be because the FHWA measure for bridges is different than what MassDOT has historically been using. The red lights for Pavement indicate that the MassDOT and CMMPO are not moving towards the target. This trend is to be expected since the measures for pavement have changed from using MassDOT's PSI categorization to FHWA's measure.

The light blue boxes are the regionally customized targets. The green lights indicate a positive trend toward the target and the silver lights indicate that the target is not being measured at the state level. Please refer to Chapter IV, Figure IV-20 and Figure IV-21, for data results for sidewalk miles in poor condition and the number of ADA-compliant ramps. In 2015, there were 17.20 miles of poor sidewalks while in 2018 there were 21.47 miles. In regards to ADA-compliant ramps, there were 2,141 compliant ramps in 2018. In 2018, there were 3,888 ADA-compliant ramps.

Table II – 9: CMMPO State of Good Repair Results

	MEASURE	PAST STATUS	TARGET (2022) - MID PERFORMANCE TARGET REVIEW AT 2020	CMMPO TREND	STATE TREND	GOAL
STATE OF GOOD REPAIR	% of Interstate NHS Pavements in Good Condition		70% of Non-Interstate NHS Pavement in Good Condidtion			*To maintain the highway infrastructure asset system in a state of good repair*
	% of Non-Interstate NHS Pavement in Good Condition		30% of Non-Interstate NHS Pavement in Good Condidtion			
	% of Interstate NHS Pavements in Poor Condition		4% of NHS Interstate Pavement in Poor Condition			
	% of Non-Interstate NHS Pavement in Poor Condition		30% of NHS Interstate Pavement in Poor Condition			
	% of NHS Bridges by Deck Area Classified as Good Condition		16% of NHS Bridges by Deck Area in Good Condition			
	% of NHS Bridges by Deck Area Classified as Poor Condition		12% of NHS Bridges by Deck Area in Poor Condition			
	Number of pavement sidewalk miles in poor condition		Reduce mileage of sidealks in poor condition by 10% over 10 years			*Improve transportation accessibility for all modes by improving roadway infrastructure*
	Increase the number of ADA compliant ramps in the region		To increase the # of ADA compliant ramps in region by 100 per yearfor a total of 2,975 compliant ramps in 10 years			

Planning Emphasis Area	US DOT National Goal	FHWA Rule
CONGESTION	CONGESTION	System Performance, Air Quality (PM3)

System Performance, Air Quality Introduction (PM3)

When traffic demand approaches or exceeds the available capacity of the highway system, the end result is congestion. Congestion is recognized as a problem of local and national importance that adversely affects both the economy and quality of life. The CMMPO has been addressing congestion by monitoring specific measures that are derived from the targets and goals in the Congestion Management Program, LRTP and TIP.

On the national level, congestion is being addressed with the FHWA Rule, PM3 that was established to improve the performance of the Interstate and non-Interstate NHS, and freight movement on the Interstate system; and traffic congestion and on-road mobile source emissions for the purpose of carrying out the Congestion Mitigation and Air Quality Improvement (CMAQ) Program.. MassDOT is responsible for most of the NHS lane miles statewide; however the CMMPO is responsible for almost 8% of the statewide NHS lane miles pertinent to this rule.

System Performance and Freight Measures

Performance on the Interstate and non-Interstate NHS is calculated through the percent of reliable person-miles traveled, or Level of Travel Time Reliability (LOTTR). Freight performance is also measured similarly through Truck Travel Time Reliability (TTTR) on the Interstate system.

Level of Travel Time Reliability Measure

LOTTR is based on the amount of time it takes to drive the length of a road segment. The metric is the percent of person-miles traveled that are "reliable" on the Interstate and non-Interstate NHS. Data for this measure is from FHWA's free National Performance Management Research Data Set (NPMRDS) or equivalent.

The calculation steps for LOTTR are as follows:

1. Collect travel times from the National Performance Management Research Data Set (NPMRDS)
2. Find the 50th percentile and 80th percentile times for each time period and calculate the ratio
3. If the ratio is below 1.50 for each of the time periods recorded for that road segment, the segment is "reliable"
4. The statewide metric is the % of the person-miles traveled that are "reliable"

Table II - 10 is an example how segments are calculated for their reliability.

Table II – 10

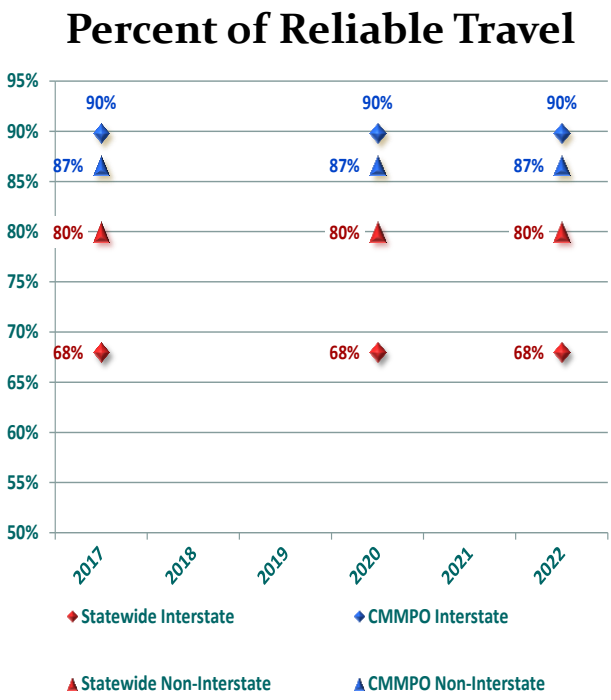
Level of Travel Time Reliability (LOTTR) *(Single Segment, Interstate Highway System)*		
Monday - Friday	6am – 10am	LOTTR = $\frac{44 \text{ sec}}{35 \text{ sec}}$ = 1.26
	10am – 4pm	LOTTR = 1.39
	4pm – 8pm	LOTTR = **1.54**
Weekends	6am – 8pm	LOTTR = 1.31
Must exhibit LOTTR below 1.50 during all the time periods		**Segment is not reliable**

LOTTR Targets

MassDOT was unable to use multi-year trend data to assist with target setting for this measure. Between 2016 and 2017, FHWA switched contractors for maintaining the NPMRDS, resulting in significant differences in data consistency between the years. Because of the differences, FHWA has advised that state DOTs set conservative targets based on 2017 data and adjust future targets when more data becomes available.

Figure II - 8 shows the statewide LOTTR targets for Interstate and non-Interstate NHS compared with the percent of reliable segments in the CMMPO region.

Figure II – 8



Truck Travel Time Reliability (TTTR)

TTR is the amount of time it takes trucks to drive the length of a road segment. This measure is only calculated on the Interstate system.

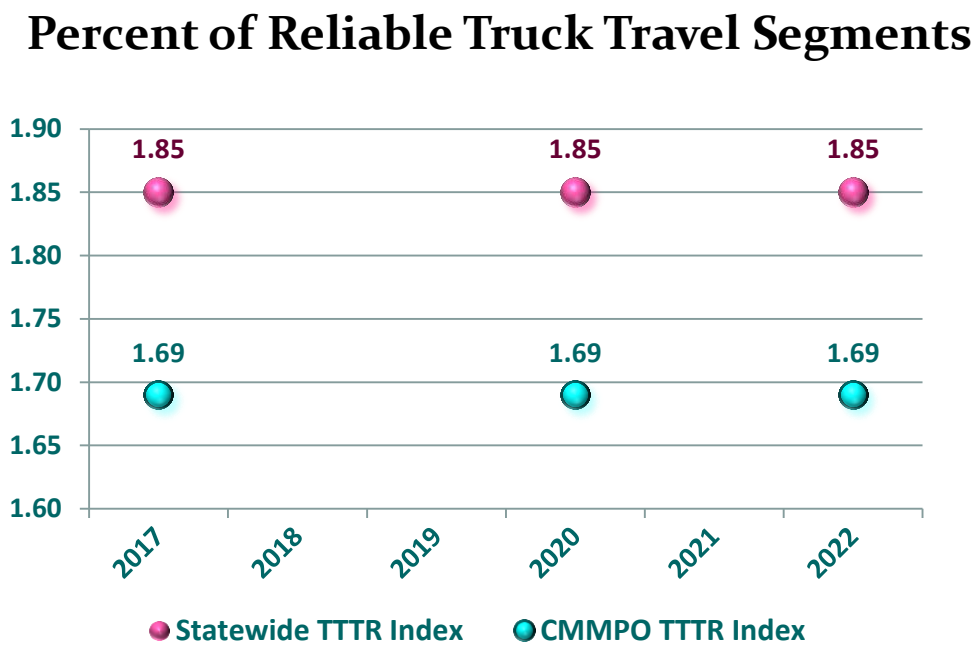
- Calculate the travel times from the five time periods used in this measure Table II - 11
- Find and calculate the TTTR ratio from the 50th and 95th percentile times for each time period
- The TTTR Index will be generated by multiplying each segment's largest ratio of the five periods by its length (in this Figure's example, 2.52), then dividing the sum of all length-

weighted segments by the total length of Interstate. Figure II - 9 is an example how the Index is calculated.

Table II – 11

Level of Truck Travel Time Reliability (TTTR) *(Single Segment, Interstate Highway System)*		
Monday - Friday	6am – 10am	$TTTR = \frac{55 \text{ sec}}{35 \text{ sec}} = 1.57$
	10am – 4pm	TTTR = 1.25
	4pm – 8pm	**TTTR = 2.52**
Weekends	6am – 8pm	TTTR = 1.2
All Days	8pm – 6am	TTTR = 1.05

Figure II – 9



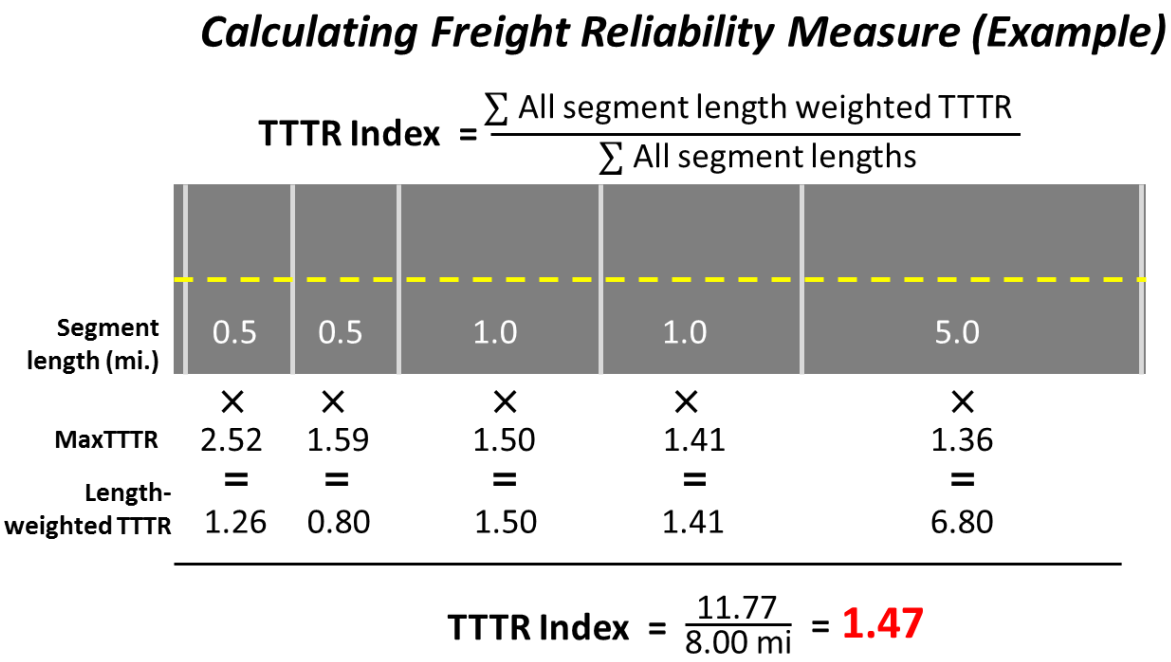
TTTR Targets

MassDOT was unable to use multi-year trend data to assist with target setting for this measure. Between 2016 and 2017, FHWA switched contractors for maintaining the NPMRDS, resulting in

significant differences in data consistency between the years. Because of the differences, FHWA has advised that state DOTs set conservative targets based on 2017 data and adjust future targets when more data becomes available.

Figure II - 10 shows the statewide TTTR targets for Interstate compared with the percent of reliable segments in the CMMPO region.

Figure II – 10



Air Quality Measures

In addition to system performance, this rule includes measures related to reducing emissions and congestion and improving air quality for the purpose of carrying out the CMAQ program. The three measures are Peak Hour Excessive Delay (PHED) per capita, percent of non-single occupancy vehicle travel, and on-road mobile source emissions.

Peak Hour Excessive Delay (PHED) Measure

This measure is only applicable for urbanized areas (UZA) of more than 1 million people with NHS mileage in nonattainment or maintenance areas for ozone, carbon monoxide, or particulate matter. All MPOs and state DOTs must coordinate on one target for 2020 and 2022 if they are a part of the UZA in nonattainment area.

- The metric for PHED indicates annual hours of excessive delay per capita on the NHS between 6am – 10am, and 3pm – 7pm

- For the purpose of this measure, the threshold for excessive delay is based on the travel time at 20 miles per hour or 60% of the posted speed limit travel time, whichever is greater.

As shown in Figure II-11The 2017 PHED per capita for the MA-NH and Worcester UZA is 18.31 and is also the target for the first performance period of 2020 unless the Worcester UZA places out of the nonattainment area.

Figure II – 11: 2017 PHED Per Capita

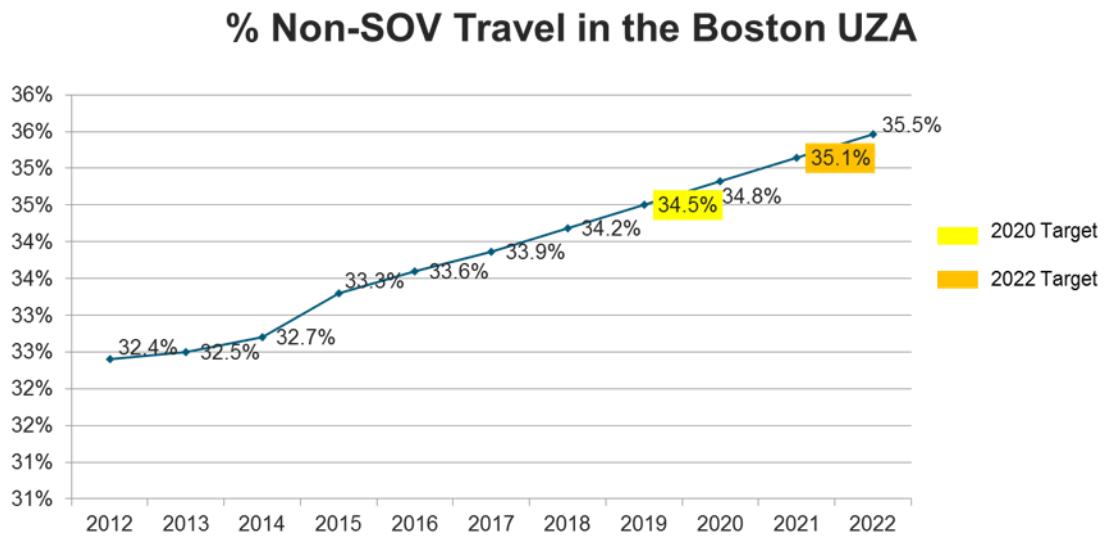
	MA+NH PHED	Total UZA Pop	PHED per Capita (Total)
2017	80,053,183	4,371,476	18.31

Percentage of Non-Single Occupancy Vehicle (SOV) Travel Measure

The metric for non-SOV travel is based on the percentage of people commuting to work using a mode other than a single occupancy vehicle (e.g. carpool, van, public transit, walking, bicycling or telecommuting). This measure is calculated by UZA as opposed to by state and MPO.

Figure II - 12 shows that the non-SOV travel increased at an average rate of .32% between 2012 and 2016. If that rate were projected out to 2022, we would expect to see the trend below:

Figure II – 12



On-Road Mobile Source Emission Reductions Measure

The on-road mobile source emissions measure is calculated by summing 2-and 4-year totals of emissions reductions in kilograms per day. This calculation is done for all projects located in municipalities classified as air quality maintenance areas (Waltham, Lowell, Worcester and Springfield) or non-attainment areas (Oak Bluffs) funded with CMAQ funds.

The only CMAQ eligible project that contributes to this measure is in the CMMPO region, noted in Table II - 12. The remaining projects noted in the table are awaiting CMAQ consultation and will contribute to the 2022 target. In the meantime, the interim target for 2020 is the emission reductions for the CMMPO project.

Table II – 12: CMAQ Eligible Projects

Year	City	MPO	Project #	Project Name	VOC Reductions	Nox Reductions	CO Reductions	CO2 Reductions
2021	Springfield	Pioneer Valley	608157	SPRINGFIELD- MCKNIGHT COMMUNITY TRAIL CONSTRUCTION, FROM ARMORY STREET TO HAYDEN AVENUE (1.5 MILES)	N/A*	N/A*	N/A*	N/A*
2020	Lowell	Northern Middlesex	607885	LOWELL- PEDESTRIAN WALKWAY & BICYCLE CONNECTION AT PAWTUCKET FALLS OVERLOOK, FROM VANDENBERG ESPLANADE TO SCHOOL STREET	N/A*	N/A*	N/A*	104,817
2019	**Worcester**	**Central Mass**	**603251**	**WORCESTER- SIGNAL & INTERSECTION IMPROVEMENTS @ HOLDEN STREET, DRUMMOND AVENUE & SHORE DRIVE, INCLUDES CULVERT EXTENSION OF W-44-122, SHORE DRIVE OVER (UNNAMED) STREAM**	**135.202**	**360.163**	**1596.514**	**1,008,888**
2019	Tisbury	Martha's Vineyard	607411	TISBURY- BIKE & PEDESTRIAN IMPROVEMENTS ALONG BEACH ROAD, FROM THE TERMINATION OF THE EXISTING SHARED USE PATH WESTERLY TO THE FIVE CORNERS INTERSECTION	0.6	0.5	9.8	1015.2
2021	Oak Bluffs	Martha's Vineyard	608142	OAK BLUFFS- CONSTRUCTION OF A SHARED USE PATH ALONG BEACH ROAD, FROM THE LAGOON POND BRIDGE NORTHERLY TO THE EASTVILLE AVENUE/COUNTY ROAD INTERSECTION	0.3	1.1	16.3	2455.3
			TOTAL		**136.1**	**361.8**	**1,622.6**	**1,117,176.4**

Air Quality Targets

The following Table II-12 summarizes the 2020 and 2022 targets for the Air Quality piece of PM3 proposed by MassDOT and adopted by the CMMPO.

Table II – 13: 2020 & 2022 Air Quality Targets

MEASURE	2017 FIGURE	2020 TARGET	2022 TARGET
Level of Travel Time Reliability	68% Interstate 80% Non-Interstate	68% Interstate 80% Non-Interstate	68% Interstate 80% Non-Interstate
Truck Travel Time Reliability	1.85	1.85	1.85
PHED	18.31	18.31	18.31
Non-SOV Travel	33.6%	34.82%	35.46%
Emissions Reduction	TBD	1,622 CO 497.9 Ozone	TBD CO 1.1 Ozone

CMMPO Congestion Results

Table II - 13 is a snapshot of the how the CMMPO is performing in the federally required (light tan fields) and regionally customized (white fields) targets. The green lights indicate the CMMPO or state is doing well; conversely the red lights indicate poor performance. The unlit or silver lights indicate that measure is not used on the state level or no past data. The yellow lights indicate that there isn't an established trend.

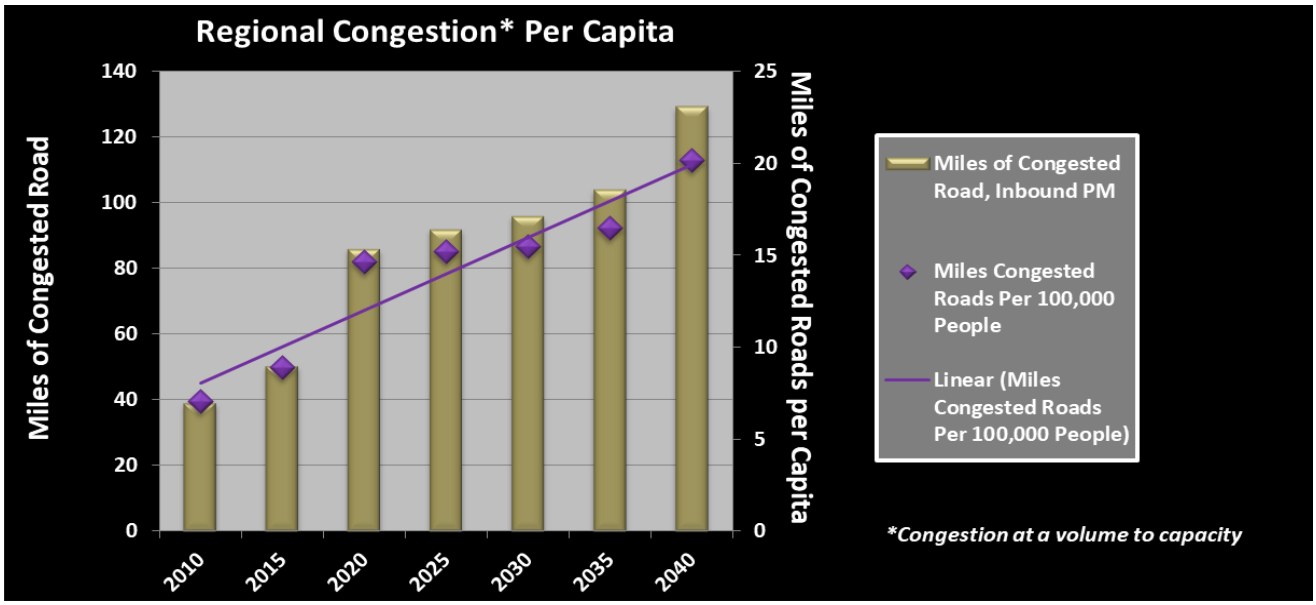
Table II – 14: CMMPO Congestion Results

	MEASURE	PAST STATUS	TARGET (2022) - MID PERFORMANCE TARGET REVIEW AT 2020	CMMPO TREND	STATE TREND	GOAL
CONGESTION	Level of Travel Time Reliability (LOTTR) on both Interstate and non-Interstate NHS		68% Interstate, 80% Non-Interstate			*To achieve a significant reduction in congestion on the National Highway System*
	Level of Truck Travel Time Reliability (TTTR) on both Interstate and non-Interstate NHS		1.85			
	% of non-single occupancy vehicle travel (SOV)		0.3546			
	Peak hour excessive delay (PHED)		18.31			
	Emissions Reduction		1,622 CO and 497.9 Ozone for 2020, TBD 2022			
	Number of Intelligent Transportation Systems (ITS) in region		Install ITS for each Highway and Transit TIP			*Reduce travel delay through ITS*
	Number of congested miles per capita		Maintain the number of congested miles per capita below established trendline			*Manage congestion with increases in population*

The first regionally customized measure is to install ITS on highway and transit TIP projects. This measure pertains to travel delays on I-290. As of 2016, MassDOT has completed 13% of Variable Message Boards (VMS) on I-290. This installation is part of a project which will place 18 Closed Circuit Television cameras and four VMS along the I-290 corridor.

The second target for managing congestion with increases in population is to maintain a congestion miles per capita figure below the established trendline. Historic, current and projected total population and congestion miles data from 2010 to 2040 were used to develop the trendline of congested miles per capita. Congestion is defined as a volume to capacity ratio of 1.4 and above. Figure II-13 shows the region's trend for congestion and congested miles per capita. As of 2015, the miles of congested roads per capita are below the trendline which means that the CMMPO is doing well. Looking ahead for 2020, the congested miles per capita is projected to be above the trendline. Between now and the next 2020 census, the CMMPO has an opportunity to implement congestion solutions to maintain the congested miles per capita below the trendline.

Figure II – 13



Transit Asset Management Plan and Performance

The Federal Transit Administration (FTA) published a Transit Asset Management (TAM) Final Rule to help achieve and maintain a state of good repair (SGR) for the nation's public transportation assets. In the TAM final rule:

- Defines the term "state of good repair"
- Requires grantees that receive FTA dollars to develop a TAM Plan
- Establishes TAM performance measures
- Establishes requirements that transit agencies will follow when reporting annually to the National Transit Database
- Requires FTA to provide technical assistance to support implementation of this rule

This rule also requires MPOs to set performance targets for the TAM performance measures for their regions in coordination with transit and state agencies. The transit agency with the CMMPO is the Worcester Regional Transit Authority (WRTA). Under the FTA rule, the WRTA is considered a Tier II Provider which is a recipient of FTA funds that owns, operates or manages (1) one hundred (100) or fewer vehicles in revenue service during peak regular service across all non-rail fixed route modes or in any one non-fixed route mode.

TAM Coordination

The CMMPO and WRTA have participated and will continue to participate in fulfilling the TAM rule requirements and in working towards a SGR for the CMMPO region. Each agency is responsible for various aspects of the TAM as summarized in the table below. The TAM plans discussed in the table must include, at a minimum an asset inventory and a condition assessment of inventoried assets, descriptions of decision support tools used to estimate capital needs and/or prioritize investments, and a prioritized list of investments to improve the state of good repair for transit assets.

TABLE II – 15 General TAM Responsibilities by Agency				
Agency	**Task: Conduct inventory and condition assessments**	**Task: Develop and implement TAM plans**	**Task: Set TAM performance targets**	**Task: Report progress on targets**
WRTA	Inventory transit assets. Report asset and condition information in TAM plans and to NTD.	Develop and implement TAM plans. Share TAM plans with the MPO and MassDOT.	Set agency-level targets on an annual basis. Coordinate with MPO and MassDOT on target setting.	Report targets and progress from prior year to NTD on an annual basis. Share progress information with MassDOT and MPO.
CMMPO	N/A	N/A	Set regional targets. Coordinate with WRTA and MassDOT on target setting.	Submit targets to MassDOT. Report on targets and progress in LRTPs and TIPs.

Target-Setting Requirements and Activities

Under the TAM Final Rule, FTA established three performance measures for Tier II transit providers to use when assessing SGR for three categories of capital assets. The following table describes the three performance measures and the targets established by the WRTA for FY18.

TABLE II – 16

WRTA TAM Performance Targets

Asset Category	Relevant Assets	Performance Measure/Target	Measure Type	Desired Direction of Measure
ROLLING STOCK	Buses > 30’	100% of fleet meets or exceeds ULB of 12 years	Age-based	Minimize percentage
	Buses ≤ 30’	100% of fleet meets or exceeds ULB of 10 years	Age-based	Minimize percentage
	Demand Response Vans	100% of fleet meets or exceeds ULB of 5 years	Age-based	Minimize percentage
EQUIPMENT	Support Vehicle	100% of fleet meets or exceeds ULB of 4 years	Age-based	Minimize percentage
FACILITIES	Admin / Maintenance Facility	0% of facilities rated under 3.0 on TERM Scale	Condition-based	Minimize percentage
	Passenger / Parking Facility	0% of facilities rated under 3.0 on TERM Scale	Condition-based	Minimize percentage

Two definitions apply to these performance measures:

- Useful Life Benchmark (ULB) – The expected lifecycle of a capital asset for a particular transit provider’s operating environment, or the acceptable period of use in service for a

particular transit provider's operation environment. For example, FTA's default ULB is 14 years. [1]

- **FTA Transit Economic Requirements Model (TERM) Scale** – A rating system used in FTA's TERM to describe asset condition. The scale values are 1 (poor), 2 (marginal), 3 (adequate), 4 (good), and 5 (excellent).

The CMMPO concurred upon these FY18 targets at its May 25, 2017 meeting. The WRTA established these FY18 targets in consultation with CMMPO staff on overall MPO performance planning. In addition, some of the CMMPO staff who conducts service planning for the WRTA participated. These targets reflect the WRTA's favorable current asset portfolio that includes:

- New or recently built passenger, maintenance and operation facilities. Its Maintenance and Operations Facility (2016) and its passenger Hub (2013), are its sole facilities, and
- A relatively low fleet average age of 6.88 years. The WRTA procured a large number of buses with ARRA funds in 2008-2009, and added six Proterra electric buses to its fleet in 2013.

SGR Performance Progress

Owing to the WRTA's new facilities and relatively modern fleet, it met each of its FY18 targets. The WRTA proposes to use the same performance targets for FY19; these will be incorporated into its first Transit Asset Management (TAM) Plan, which is now being finalized for submittal to FTA. Going forward, the WRTA (and all transit providers) will update their TAM plan at least every four years, and update the CMMPO annually on performance targets, investment strategies, and an annual condition assessment as is required under 49 CFR§625.53.

Public Transportation Agency Safety Plans and Performance

On July 19, 2018, FTA published the Public Transportation Agency Safety Plan (PTASP) Final Rule, which requires certain operators of public transportation systems that receive federal funds under FTA's Urbanized Area Formula Grants to develop safety plans that include the processes and procedures to implement Safety Management Systems (SMS).

The PTASP rule is effective as of July 19, 2019 and has recently deferred applicability of the PTASP development for small operators (less than 100 fixed route buses operating at peak service) who receive FTA grant funds under sections 5307, 5310, and 5311. The WRTA is included in this provision and FTA requires MassDOT to develop a PTASP on all small bus

[1] https://www.transit.dot.gov/PerformanceManagement

operators' behalf. It is the responsibility of the WRTA to implement the PTASP developed by the state and will be coordinating with appropriate agencies as this unfolds.

CHAPTER III

Transportation Linkages

Introduction

Mobility2040 summarizes the efforts, the accomplishments to date and the identification of future transportation needs in the region in consultation with local communities and in cooperation with public and private entities. This chapter introduces the "linkages" from the transportation planning perspective. These linkages are overarching themes that influence or are relative to the decision-making process. Since there are real financial constraints to pursue all the transportation needs in the region, the linkages act as a compass by providing thorough and thoughtful weight to the planning process.

Land Use

How land is used and developed is a key factor that contributes to the character of a community. Farms, roads, housing, businesses, and other features are spread throughout the region in a variety of ways and in distinct areas. It is critical to assess the connections between land use patterns and transportation to determine how they currently impact one another in order to strategically plan for future needs.

The design of transportation infrastructures such as roadways, sidewalks, access points, and bicycle/pedestrian network can determine the overall character of the community and the people that travel through the community. Conversely, how the land is utilized or zoned can affect the types of transportation facilities that are built, the way people travel, and the types of services offered to the community.

The CMMPO region's land use patterns continue to change in response to considerable development pressures and economic forces. In many locations, former agricultural properties now host subdivisions, shopping centers, and industrial parks. The early pattern of development in the 1700's and 1800's also entailed the presence of manufacturing centers located on rivers and streams as a source of power for mills and factories. Around these mills sprouted self-contained villages to supply workers and the surrounding area by necessity contained farms and forests with residents engaged in production of food and crafts to meet local needs. These villages today lend each community its own distinctive character and are cherished by residents. But growth and development outside of these town centers has taken on a vastly different character. With permissive development regulations, growth has taken on characteristics of "sprawl," resulting in large lot subdivisions, strip corridor commercial development, and new residences rising as continuous frontage development along once rural

country roads. Farms and forests are gradually disappearing, impacting wildlife and natural communities, while requiring ever-increasing costly solutions for maintaining environmental quality. Slowly, the region's traditional character that exemplifies New England is being replaced by a less distinctive suburban landscape.

Priority Development Areas

Local and regional planning must continue to prioritize open space protection and consider sustainable growth patterns of development when making land use decisions. Priority Development Areas (PDA), in many cases, are existing areas that communities are seeking to revitalize. PDAs are those areas that have been identified as capable of supporting additional development or as candidates for redevelopment. These preexisting developed areas are ideal to align with the State's principles of prioritization planning. Focusing on these areas will result in more compact development patterns that has been the norm over the past 60 years. By contrast, Priority Preservation Areas (PPAs) are areas within a city or town that deserve special protection due to the presence of significant environmental factors and natural features. PPAs are not on lands that are currently permanently protected, however their designation provides local officials with specific targets for preservation and conservation efforts and thus, may further steer development into PDAs and other areas of potential development and redevelopment. CMRPC completed the Blackstone Valley, Central 13, and Rural 11 Prioritization Plans and participated in the 495/Compact Plan completed in 2012. In 2018, staff worked with the 495/MetroWest Corridor Partnership to update the 495/Compact Plan (2012), and gather updated information on the PDAs of seven CMMPO towns, including Berlin, Grafton, Hopedale, Northborough, Shrewsbury, Upton, and Westborough. These plans identified a number of PDAs and PPAs which are intended to attract and concentrate development and redevelopment in each subregion, including where additional infrastructure investments would be targeted which were identified as Priority Infrastructure Investments or PIIs.

Currently there are 23 state-designated PDAs within the CMMPO region which are located within Grafton, Millbury, Northbridge, Shrewsbury, Southbridge, Spencer, Sturbridge, Webster, Westborough, West Boylston, and Worcester.

Based on the Southern Worcester County Comprehensive Economic Development Strategy Report, (2018 CEDS) there are over 332 properties for sale within the region, consisting of 153 parcels of land, 64 office buildings or spaces, 54 industrial buildings, 49 retail spaces, 11 flex-use spaces, and one property for medical use. There are also 586 properties currently available for lease in the CMMPO region. Of these properties, there are 252 properties available for office

use, 111 properties available for industrial use, 166 properties for retail use, 32 properties for flex-use and 25 properties for medical use.[1]

MassEcon administers the ReadyMass100 program which selects top 100 properties in the state that have been determined to reflect a high level of marketability.[2] The listed properties have been identified to attract prospective companies and site selectors to consider Massachusetts as an expansion location. There are currently 8 properties within the CMMPO region that have been accepted to the ReadyMass100 program which are located in Charlton, Grafton, Oxford, Sutton, West Boylston, and Worcester. These properties comprise of approximately 340 total acres, and have met key criteria relating to infrastructure, permitting, size and readiness.

Most CMMPO communities support economic growth, however, many are conflicted about development growth. Residents and officials often oppose continuous sprawl, but worry that higher density development will ultimately increase the size of the community, with a corresponding burden on resources. They also worry that high density development will negatively impact their desire to preserve a small town character. While greenfield development will likely continue, staff are working with the communities to direct commercial and other large-scale development to specific sites targeted in CMRPC-developed sub regional Prioritization Plans (i.e. Blackstone Valley, Central 13, Rural 11, and 495/Compact Plans).

The CMMPO region can advance development within its communities by participating more in existing listing and site certification programs that are currently in use, such as the Expedited Permitting program, or Massachusetts General Law Chapter 43D. This program creates a transparent process to expedite municipal permitting to create a "Priority Development Site" (PDS). A PDS is a publicly or privately-owned property that is designated at the local level and approved by the State Interagency Permitting Board. In order to become eligible to participate in the program, sites must be Commercial, Industrial, Residential, or Mixed Use, and there must be development or redevelopment of at least 50,000 square feet of gross floor area in a new or existing building/structure. Of the 40 CMMPO communities, currently there are only 11 that are designated Chapter 43D communities including: Boylston, Douglas, Grafton, Northbridge, Millbury, Sutton, Shrewsbury Sturbridge Uxbridge Westborough, and Worcester.[3] One advantage to opting into Chapter 43D includes priority consideration for the MassWorks Infrastructure Program grants, brownfields remediation assistance, and other financing through

[1] CoStar Group Data at www.costar.com, Retrieved from Southern Worcester County Comprehensive Economic Development Strategy (CEDS) Report (2018) https://www.worcesterchamber.org/
[2] https://massecon.com/services/readymass100/
[3] https://www.mass.gov/service-details/chapter-43d-communities

quasi-public organizations. The Massachusetts Office for Business Development (MOBD) offers other beneficial programs to advance development including the Economic Development Incentives Program (EDIP), which is the State's investment tax credit program for businesses and the District Improved Financing (DIF), which is used for designating development districts.[4] CMMPO communities can better facilitate business growth and expansion in order to enhance their local economies and create dynamic places to live and work by implementing progressive ordinances and zoning, as well as streamlining local and state permitting.

As Central Massachusetts policymakers continue to steer development toward sites located in areas formerly designated as PDAs, CMMPO staff expects that the development pressures in its fastest-growing communities will continue to consume both PDA and non-PDA sites. The City of Worcester is an exception, as significant site redevelopment and revitalization is occurring as exampled by the reconnaissance of the City's Canal District with the reconstruction of Kelley-Square along I-290 ramp and the redevelopment of a Wyman-Gordon Brownfields site into the "Polar Park" ballpark, expected in 2021. This is occurring at the same time as demand for urban living is occurring on a national basis, which is also having an effect on downtown Worcester development. For example, since 2016 the City has built two hotels and two apartment buildings, including commercial retail shops just within the downtown core surrounding Union Station consistent with the Transit Oriented Development (TOD) planning approach. The impact of these land use development trends will likely put increased demand upon major and minor arterial roadways with growth in suburb-to-suburb commuting. High traffic volume growth on major arterials over the past decade is projected to continue into the foreseeable future, particularly as autonomous vehicles enter the marketplace and resistance to dense development outside Greater Worcester escalates.

In the past decade, millennials nationwide have generally sought to live and work in more urbanized environments, the magnitude of this trend is lower in the CMMPO region than in Greater Boston. CMMPO staff recognizes that the pendulum toward increased urban living is beginning to swing back toward suburban areas with young professionals or millennials are delaying household/family formation, especially at a later age compared to previous generations, combined with a rapid increase in older adults. Improved integration of land use and transportation planning can reduce the need for highway expansion and maintain the quality of our communities and ultimately the region.

[4] https://www.mass.gov/service-details/smart-growth-smart-energy-toolkit-modules-district-improvement-financing-diftax

Planning Approaches

Livable Communities

According to the American Association of Retired Persons (AARP), "A Livable Community is safe and secure, has affordable and appropriate housing and transportation options, and offers supporting community features and services. Once in place, those resources enhance personal independence, allow residents to age in place, and foster their engagement in the community's civic, economic, and social life." Ensuring that the community is livable means ensuring that both the social and physical conditions of the environment is adequate enough to support a long, healthy lifestyle. This means establishing partnerships and building local policies focused in achieving broader community goals such as access to jobs, affordable housing, quality education and safer streets. This also means understanding the varying needs of the community members, and recognizing the region's changing demographics and identifying structures to support the diverse population.

Livable transportation strategically connects all modes: bikeways, pedestrian facilities, transit services and roadways into an intermodal and interconnected system. These strategic connections are dependent on land use policies. CMRPC is developing "Village Center Overlay Districts" for the towns of West Brookfield, Auburn, Hopedale and Holden to encourage a district that respects the historic context of the town center and to promote a safe framework for pedestrians, bicyclists and motorists. The main focus of these districts is to encourage a mixture of uses, while fostering the communities' economic growth through a thoughtful development, including the adaptive reuse of abandoned, vacant or underutilized buildings or structures within the district.

Gateway Cities

The Commission on the Future of Transportation on its report "Choice for Stewardship: Recommendations to Meet the Transportation Future, Vol. 1" clearly state that Massachusetts public policy and investments should reflect the linkage between land-use, transportation and economic development. The Commission envisions Gateway Cities to act as economic anchors in their respective regions while increasing public transit ridership. The underlying conception is that Gateway Cities have higher rates of residents who are unemployed, low-income, and higher rates of households without access to a car, but at the same time, these areas also have many amenities that employers, entrepreneurs and residents seek but cannot afford in area closer to Boston. To have an idea of how the foreseeable future would look like, the Commission explore four potential scenarios:

- Scenario 1: Gridlock – Fast growth in Boston and surrounding communities without expansion of existing transportation system.
- Scenario 2: Vibrant Core – Growth of the Greater Boston metro region supported by new transportation technologies and systems that facilitate the success of a vibrant and livable metro region.
- Scenario 3: Multiple Hubs – High density growth occurs in several cities and their regions throughout the Commonwealth. Expanded mobility options allows for lower cost housing and job creation outside the Greater Boston core.
- Scenario 4: Statewide Spread – Full technology adoption with heavy reliance on telecommunications, hence higher dispersion of population and jobs statewide to less-expensive, low-density suburbs and rural areas.

The Commission ultimately recommends that hub cities take the lead in developing the economic and housing plans that can maximize the opportunities for their regions. Moreover, the Massachusetts' Economic Development agenda is focused on Gateway Cities, which ties economic development with transportation investments. One of the recommendations from the Commission is for the regional transit authorities to look at potential express connections to other hubs within the region. They also, recommend the MPO's to develop strategies that outline economic growth and housing that clearly reference transportation policies and investments; hence, facilitating and supporting Gateway Cities development.

Transit Oriented Development

Transit Oriented Development (TOD) is a land use approach that combines a high-density mixed use developments around half-a-mile of a transit station. These zones are characterized by their accommodations for bicyclists and pedestrians. Tone of the recommendations of the Commission on the Future of Transportation is to accelerate the adoption of land use regulations that promote density in transportation-efficient locations.

A TOD may require changes in zoning codes to allow higher densities, inclusive zoning and an appropriate mixture of uses. TODs are recognized for alleviating congestion and increases in ridership and revenues for public transit agencies. Moreover, offers the opportunity for public-private investments and revitalization of transit-dependent areas within the city core. This approach is supported by the FTA by providing technical and financial assistance to communities that wish to pursue TODs.

In addition to this, the MassInc Gateway Cities innovation institute coincides in the need of prioritizing land near transit for high density residential and commercial development by

providing affordable housing options and workforce opportunities consistent with TOD practices.

Housing

Currently the Central Massachusetts Region contains approximately 221,364 occupied housing units, which is approximately 7.7% of the state's housing units. The U.S. Department of Housing and Urban Development (HUD) reports that there were 4,875 housing units produced in the region between 2013 and 2017. As previously noted, the CMMPO region is expected to add over 84,500 people and nearly 60,000 household units between 2010 and 2040.

According to the 2017 U.S. Census Building Permit Survey there were 17,728 new units built in Massachusetts, or 70% of New England's new housing building permits. Data for the Worcester, MA-CT metropolitan area, comprises 10% of Massachusetts housing stock (1,768 new housing units). Moreover, 73.3% of the units built on the Worcester, MA-CT metropolitan area were single-unit housing.

One of the major challenges in the region is that housing production is not always aligned with regional transit investments. Housing located further from economic centers of town can result in traffic congestion with longer commutes.

Housing Programs

The Commonwealth has a commitment to increase the production of housing across all income levels. As such, cities and towns can access several programs in order to satisfy local demand. A Housing Production Plan (HPP), includes an assessment of needs and demand with an analysis of development constraints to meet the local affordable housing needs. By January 2019, the towns within the CMMPO region with an approved / current HPP are: of West Boylston, Boylston, Grafton, and Auburn. The towns of Douglas, Shrewsbury, Northborough and Upton have their HPP expired.

Another program available to the communities is the Smart Growth Zoning Overlay District, also known as the Chapter 40R. By creating this overlay the communities can create a denser residential or mixed-use district, including affordable housing close to transit stations, town centers or other highly suitable locations. In the region, only Fisherville Mill in the town of Grafton is zoned under the Chapter 40R code.

More recently, the State launched the "Housing Choice Initiative". This initiative rewards municipalities that have produced certain rates or amounts of new housing units in the last five

years and that adopted best practices related to housing production that will sustain a 21st century workforce and increase access to opportunity for Massachusetts residents.

As of 2018 there were six Housing Choice Communities in the CMMPO region including Berlin, Boylston, Holden, Rutland, Worcester, and Grafton, for a total of 1,729 permitted new units. There are also 14 Small Town Housing Choice Communities (Less than 7,000 population) in the region including Princeton, Barre, Oakham, Paxton, Hardwick, New Braintree, North Brookfield, West Brookfield, East Brookfield, Brookfield, Warren, Hopedale, Mendon, and Millville.

CMMPO staff assisted the Town of Boylston with its Housing Choice Grant application. This award ($83,500) will fund a traffic engineering study for the Route 140/Sewall Street intersection. This project will consider reconfiguring the layout for better traffic flows associated with the proposed development of 66 units of apartments affecting the North Sewall Street intersection, a recently approved 30-unit Senior Residential Development on South Sewall Street, and a 57-lot subdivision that is nearing completion.

During the same period, Mendon received a Small-Town Housing Choice grant ($26,500) to conduct a site readiness study and public water supply analysis on a town-owned parcel with 3 acres of developable land, which might support 40 to 50 units of new housing. The town purchased the parcel with Community Preservation Act (CPA) funds with the intention of seeking developers for an affordable housing development. The analysis should increase the project's likelihood of success and make it more attractive to potential developers.

Another program available for communities is the MassWorks Infrastructure Grants. This program provides a flexible source of funds to complete public infrastructure projects that support and accelerate housing and job growth. As an example, the Town of Charlton was granted more the $2.6 million of dollars for new construction and improvements of a water main along the Route 20 in Charlton, directly benefiting 131 acres in Charlton and Oxford for new commercial development complementing MassDOT’s funds for the Charlton-Oxford major infrastructure project along Route 20. Another example in Oakham is the use of funds for the reconstruction of Ware Corner Road and South Road, while replacing failing culverts and pursuing a full-reclamation and repaving project to improve safety and transportation access for residents, small businesses and emergency management vehicles in town. Warren received MassWorks funds to complement a Community Development Block Grant to improve roadway drainage and sidewalk improvements on Quaboag Street, a designated environmental justice area.

Senior Housing

Over the next 20 years, the baby boomers will gradually enter the older adult cohort. Current trends shows that Baby Boomer workers are leaving the workforce, but not the region, resulting in unique challenges with housing infrastructure, decline in school-student enrollment, and service needs/costs. The CMMPO Region must plan accordingly for an aging population through a concentration of senior citizen inclusive municipal planning including accessible transportation, economic support, elderly services, senior housing development and affordable healthcare coverage. It is important to understand that there is no one-size fits all senior housing strategy. Future housing development and production should vary based on the individual's age or mobility levels.

Current trends of Senior Living, also known as 55+ Communities or age-restricted living communities include co-housing, or "mini" communities with more options for living situations and design components among neighbors/members. Also, independent living or "Aging-In-Place" is more likely to occur in neighborhoods or communities that are livable, walkable, and sustainable where older people can stay in their existing homes.

A more recent senior living trend combines the needs/shared interests with other age groups. An example is the Boston's "Intergenerational Homeshare Pilot" program that houses graduate students with independently living seniors who need assistance with house maintenance and mobility, students need inexpensive housing; results are a win-win for community members.

Among the benefits of senior living communities are the opportunity to provide the necessary services for the aging population in a centralized location (transport, healthcare, etc.). It also reduces complications from individual Aging-In-Place (funding sources, building maintenance, and access to services). The co-housing and Aging-In-Place models allows for greater or continued sense of community choice, relationships with neighbors, and achievement/ accomplishment (purchasing and living in own home for significant time period). Moreover, co-housing allows for both a small community structure and greater control over individual home or unit than in a community setting. Also, some cities are amending zoning regulations to allow the construction of additional dwelling units (ADU). ADU's can reduce need for municipal funding while allowing senior citizens to remain with family (and also help reduce caregiver costs if family assists with needs) considering that approximately 75% of senior citizens live in a single family, detached home.

Among the challenges related to senior housing are making the housing units accessible. Older or individual homes may require significant upkeep/maintenance/renovations and retrofitting

(widening hallways or addressing issues with stairs), whereas new age specific housing may require new construction or site development. Also, distance from town center can lead to lack of access to services, reduced economic capacity, isolation from the larger community and depression, etc. Furthermore, transportation services can experience difficulties to sufficiently fund and appropriately accommodate individuals.

It is important to include senior population in planning process to appropriately assess community needs. It is recommended that housing options for the elderly consider affordability, location and universal design. Centrally located senior living communities in mixed use / higher density areas increases access to services and encourages greater activity within the community. It is known that incorporating senior living needs reduces renovation/retrofit demands over time. Also, universal design elements are one way of reducing costs and renovation time. ADU additions to existing homes are also recommended to promote "Aging in Place". Moreover, transportation accommodations and street design, including sidewalk and curb renovations are encouraged to ensure accessibility and safety for pedestrians of all ages and abilities.

Planning Ahead

The CMMPO region is expected to experience continued new growth and will likely require major transportation and other infrastructure upgrades, keep existing systems in good repair, and stimulate transit and mobility-on-demand service options across the region. New commercial and residential growth must occur in a manner that encompasses a diverse housing stock and is respectful of open space resources, transportation networks, and water resources in the region. The CMMPO will work with its communities to promote and implement progressive ordinances and zoning as appropriate, streamlining local and state permitting to facilitate sustainable development. In doing so, staff will also continue to assist communities with the Housing Choice Initiative through technical assistance support and grant-writing efforts for multiple state-funded programs. Additionally, the CMMPO will work with communities to plan accordingly for an aging population through promoting regulatory innovation and adoption of best practices in order to advance sustainable housing production and support the changing population. Staff will incorporate the CommunityViz model and other visualization/analysis software tools into the comprehensive planning process and scenario planning to better analyze choices about development, growth, and change over the years to come. Currently other MPOs are utilizing the GIS-based CommunityViz tool to visualize, analyze and communicate important decisions or improvements related to development, land use, transportation, and conservation. Sustainable new growth will involve the creation and

maintenance of well planned-transportation networks and, where available, an effective public transit system that will coordinate with and build on existing transportation and encourage multi-modal uses and mobility innovations. Coordinated planning and implementation efforts will also be crucial, particularly where jurisdictions and boundaries intersect.

Economic Development

Multi-modal transportation planning helps connect workers to employment opportunities, thereby facilitating economic growth. The CMMPO region is currently experiencing an economic recovery, inextricably linked to national economic factors and to the strength of the Greater Boston economy. The 'agglomeration' factor between the region and the Greater Boston economy is well documented.[5] The CMMPO regional population growth has outpaced many other regions of Massachusetts, as it offers comparatively lower housing costs than in communities to the east and a comparable quality of life.

While CMRPC projects healthy future population and employment growth in its region, it must acknowledge that its performance is inextricably linked to growth statewide and in adjoining regions. By targeting mechanisms that drive economic development, such as encouraging commercial development, creating or rehabilitating public spaces, requiring inclusion of affordable housing units, leveraging existing infrastructural assets, and other policies that promote livability, walkability, bike-ability, and sustainability, the CMMPO can continue to position itself as an innovative regional economy.

Industry

The CMMPO region is home to a diverse group of industries. Historically the region was a center for agriculture, manufacturing, and education. While both agricultural and manufacturing activities in the region have declined significantly, they remain important employment sectors poised for steady growth. The CMMPO region consists of four industry clusters that represent the largest employers in the area including: Manufacturing; Professional, Scientific and Technical Services; Educational Services, and HealthCare and Social Assistance; and Finance and Insurance. Together these industry clusters accounted for nearly 57% of total employers with a combined employment of over 160,000 in the CMMPO region from 2011-2016.

[5] MassInc. 2018. The Promise and Potential of Transformative Transit-Oriented Development in Gateway Cities.

Although the Massachusetts Executive Office of Labor and Workforce Development anticipates a 5% decrease in Manufacturing employment over the next decade, several manufacturing subsectors located in the region are expected to experience employment growth. These subsectors include food manufacturing (+3.1%), paper manufacturing (+4.2%), nonmetallic mineral product manufacturing, and electrical equipment (+4.1%), appliance, and component manufacturing (+4.1%). In addition, Worcester County alone has more farms compared to any other county in Massachusetts with 1,526 total farms and the region was ranked 6th out of all counties nationwide in farm to consumer sales.[6]

Of the four industry clusters, three are targeted as primary growth opportunities for the region including: Manufacturing; Professional, Scientific and Technical Services; Educational Services, and HealthCare and Social Assistance. Due to the wide prevalence of farms in the region, agriculture was also identified as a target industry cluster.

Over the same period, there were three industries with the largest percentage increases in employed people including: Arts, Entertainment, and Recreation, and Accommodation and Food Services (18.68%); Professional, Scientific, and Management, and Administrative and Waste Management Services (12.58%); Educational Services, and Health Care and Social Assistance (8.51%).

Employment and Unemployment

Between 2000 and 2010 employment decreased about 3% and is expected to get back to the 2000 levels on a regional basis by 2040. This was a trend observed by the entire nation and Massachusetts due to the economic recession in 2007-2008.

In 2000 the Central Massachusetts Region was home to approximately 245,000 jobs, about 7% of all jobs statewide. That number decreased to 224,000 in 2010. Following the national recession in 2008, some economists predicted that employment in the region would not reach 2005 levels until 2017 or 2020. Economists projected that by 2040 the region would host 244,000 jobs, about 6.9% of all Massachusetts jobs. This trend seems to be on par with historical data.

The labor force in the region, or the population 16 years of age or more that are working or actively looking for a job was 67.8% in 2016. As shown in Table III-1, the average

[6] Southern Worcester County Comprehensive Economic Development Strategy (CEDS) Report, 2018. Retrieved at: https://www.worcesterchamber.org/

unemployment rate in the CMMPO region was 6.2% in 2016, an estimate of 22,634 people over the age of 16 that were actively looking for a job. [7]

Table III-1: Unemployment Rates, CMMPO Sub-regions & Massachusetts, 2011-2016

Region	Unemployment Rates					
	2011	2012	2013	2014	2015	2016
Southern Worcester County	7.4	8	8.4	7.8	7	6.2
Massachusetts	8.1	8.5	8.9	8.4	7.6	6.8
North Sub-region	7.1	7.5	8.1	7.1	5.8	4.9
Northeast Sub-region	5.3	5.5	5.8	5.3	4.6	3.8
Southeast Sub-region	6.7	7.7	8	6.9	6.4	5.8
Southwest Sub-region	8.1	8	8.6	8.3	7.8	7.2
West Sub-region	7.7	8.3	9	8.8	7.6	6.6
Central Sub-region	9.3	10.8	11	10.5	9.9	8.8

Source: U.S. Census, American Community Survey, 5-Year Estimates, 2011-2016

Workforce Characteristics

One of the CMMPO region and the Commonwealth's greatest advantages is its highly educated workforce. The CMMPO Region is home to a total of 13 higher education institutions including numerous technical and vocational schools. Compared to the state average, the CMMPO Region falls slightly under the Commonwealth's percentage of the population aged 25 years or older with a Bachelor's degree or higher (37.53%) for 2016; however the regional average is above the U.S. percentage of the population with a Bachelor's degree or higher (30.30%).

The high level of educational attainment and strong educational presence in the region prepares for a highly skilled workforce. These factors combined enable the CMMPO Region to generate and support economic growth, because they may be deciding factors for businesses to expand in and/or relocate to the region. However, despite the systems in place that support a highly skilled workforce, young professionals may also choose to relocate to seek better employment opportunities if the existing structures are adequate or lacking. Economic growth in the region is highly dependent on maintaining and retaining a workforce with high and diverse skill levels. As noted before, Baby Boomer workers are leaving the workforce, but are not relocating from their homes. At the same time, the region is witnessing an outward migration of young professionals and must plan accordingly for both an aging and a millennial population across a variety of sectors.

[7] Southern Worcester County Comprehensive Economic Development Strategy (CEDS) Report, 2018. Retrieved at: https://www.worcesterchamber.org/

As noted by the 2018 CEDS, the region must program and implement senior citizen inclusive economic development, including accessible transportation, elderly service, senior housing development, and affordable healthcare coverage. The CMMPO Region must also work to retain young professionals aged 18-24 to offset the aging population by creating employment opportunities that are both attractive to foster local economic growth and conducive to enhanced quality of life. Connectivity amongst these populations is extremely critical to the region's livelihood and should be prioritized in the long-term to help support the CMMPO workforce.

According to the Central MA Regional Workforce Blueprint, the region must align the education of its labor force to meet the demands of the region's employers in order to foster strong economic growth in the long-term. The higher education institutions in the region can contribute to this by providing post-secondary degrees to the future supply of workers. It is also important to facilitate engagement between vocational and technical schools in the CMMPO Region to align workforce training and skills development with the needs of target industry clusters and other industry sectors. The future supply of workers will help meet the demographic challenges posed by the aging workforce and the increasing demand for educated workers.

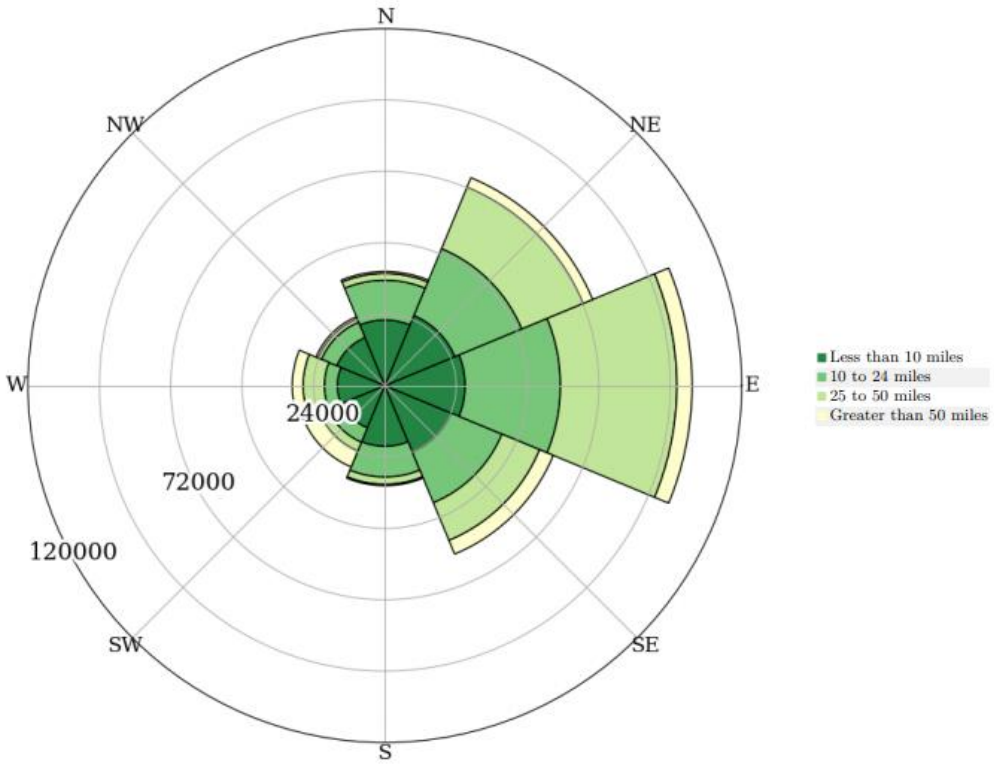
Commute to Work

While many of the region's residents live and work in the same community, an increasing number of residents' commute to jobs outside the region. It is also recognized that a region can become more competitive as its transportation systems expand. Based on the U.S. Census Bureau's "OnTheMap" report for all jobs for all workers in 2015 (Table III-2), the inflow of workers to Worcester County was 114,087 workers, whereas the output was 175,573 workers. In addition, 222,367 live and work within Worcester County, hence, their commute patterns are within the county. In other words, 33.9% of the workers in the Worcester County commute from an area outside the county. For those who live in the county, only 44.1% commute to work outside the county.

Table III-2: Worker Totals and Flows for Worcester County, 2015

WORKER TOTALS AND FLOWS	COUNT	PROPORTION
Employed in Worcester County	336,454	100.0
Employed in Worcester County but Living Outside the County	114,087	33.9
Employed and Living in Worcester County	222,367	66.1
Living in Worcester County	397,940	100.0
Living in Worcester County but Employed Outside	175,573	44.1
Living and Employed in Worcester County	222,367	55.9

Figure III-1: All Jobs for All Workers in 2015, Living in Worcester County
Distance and Direction from Home Census Block to Work Census Block



Source: U. S. Census Bureau, OnTheMap Report. Retrieved at: https://onthemap.ces.census.gov

Travel patterns for those living in the county but working outside are mostly less than 10 miles, 42.2%. As shown in Figure III-1, there's a gravitation towards the East, with a share commuting towards the I-495 Northeast/Southeast corridor. In summary, for those living in the Worcester County, 28.6% commutes a distance of 10 to 24 miles between home and work from, another

23.0% commutes 25 to 50 miles and only 6.2% or 24,799 workers commute a distance greater than 50 miles. Of those commuting more than 50 miles, 23.1% commutes Southwest (5,729 workers), 20.6% commutes towards the East (5,105 workers), and another 20.0% commutes Southeast (4,975 workers), while 13.9% commutes Northeast (3,452 workers). Such commutes consume more transportation resources and place greater burdens upon an aging transportation system.

The MBTA Framingham/Worcester line serves the commutes towards the East. This line has a weekday ridership (2014) of 16,293, 12.6% of total commuter rail weekday ridership[8]. Worcester Station is among one of the highest ridership stations, ranked 8 of 10 with 1,475 daily inbound boardings and a capacity of 500 parking spaces. Other commuter rail stations in the CMMPO region are Grafton and Westborough. The commuter rail service covers a fraction of the demand for commuters towards the Eastern region. The MassInc report: "*The Promise and Potential of Transformative Transit-Oriented Development in Gateway Cities"* suggests that Worcester's commuter rail ridership will triple if a "Gateway City TOD" is developed. Other destinations towards the Northeast or Southeast lack of any transit or mobility option for workers living in the CMMPO region and working outside the Worcester County.

Planning Ahead

The WRTA system effectively connects residents living in densely developed areas with most employers, but currently cannot serve suburb-to-suburb commuting. The existing system does not adequately provide first and last mile connections of workers to employment opportunities between the smaller communities and larger employers. Additionally the outward migration of young professionals combined with wave of Baby Boomers that are leaving the workforce but remaining in their homes, emphasizes the need to thoughtfully plan for millennials and older adults as key contributors to the regional economy. The deteriorating and overburdened roadway network poses another challenge to attracting businesses and residents and retaining young professionals who might prefer to walk or bicycle. Moreover, the rural areas in the region lack adequate infrastructure to promote safe walking and bicycling and mostly rely on private providers for their mobility needs. This unique dynamic calls for right-sizing, innovative transportation facilities and solutions that are context-sensitive to local and sub-regional needs in order to create more interconnected systems. In order to create and sustain dynamic places to live and work, it is important that CMMPO communities encourage commercial development, create public spaces, and include affordable housing units and other policies

[8] MassDOT. MBTA State of the Service. Commuter Rail. 2014. Retrieved at https://cdn.mbta.com/uploadedfiles/About_the_T/Board_Meetings/StateofCommuterRailSystem.pdf.

aimed at making the region's communities more walkable, bikeable, and livable. As next steps, the CMMPO will work with communities in identifying infrastructure investment targets and accessing grants and other state funding resources to improve deteriorating infrastructure. Staff will continue to assist communities with leveraging and improving existing paratransit services provided by the WRTA in partnership with the Councils on Aging. A component of this may include exploring best practices to assist carpooling or rideshare commuters. Furthermore, the CMMPO will explore alternatives to improve workforce transportation by partnering with local Chambers of Commerce, employers and other stakeholders and together look for solutions that will improve workers quality of life.

Travel and Tourism

Policy Background

The Fixing America's Surface Transportation Act ("FAST Act") expanded the scope of consideration of the metropolitan planning process to include ***enhancing travel and tourism.*** *[23 U.S.C. 134(h)(1)(I) & (J)]*

Related to the federal emphasis area enhancing travel and tourism, the Transportation Research Board's (TRB) National Cooperative Highway Research Program (NCHRP) Synthesis 329: "Integrating Tourism and Recreation Travel with Transportation Planning and Project Delivery", provides guidance on how to integrate planning activities that could be applied in the CMMPO region to enhance travel and tourism.

Transportation projects related to travel and tourism reflect a variety of needs and motivations and were defined to address the following:

- Alleviating traffic congestion and air quality concerns near visitor attractions
- Creating better access and mobility to meet the special needs of different traveler segments
- Investing in tourism as a means of economic development
- Improving traveler information resources
- Preserving valued historic, cultural, and environmental assets
- Linking existing but currently separate tourism attractions
- Competing travel demand needs of area residents and visitors

The CMMPO recognizes the travel and tourism federal emphasis area in the Regional Performance Measures Scoresheet. The main objective is to enhance the region's travel and tourism opportunities. The target is to improve traveler access, mobility and linkages to sites of

touristic value and balance the travel demand needs of area residents and visitors. Projects are scored based on the following criteria:

- The presence of a tourist attraction or recreational area within the project limits
- The project is improving the mobility to and from these tourist attractions or recreational areas.

Economic Impacts of Tourism

The travel, tourism, and hospitality industry is one of the largest industries in the Commonwealth. Data from the U.S. Travel Association shows that in 2017, domestic and international travelers directly spent $22.9 billion in the Commonwealth, an increase of 4.6% compared to 2016. The biggest share of the total came from the domestic traveler, $18.7 billion, while the international traveler spending totaled $4.1 billion. Travel expenditures directly supported 149,400 jobs and generated more than $3.6 billion in tax revenue for federal, state and local governments in 2017.

Worcester County also benefited from the tourism industry; it ranked 6th among all counties in the Commonwealth. Domestic traveler's expenditures in Worcester County (direct, indirect and induced outputs) totaled $935.20 million in 2017, supporting more than 5,970 jobs and generating more than $21.82 million in local tax revenue.

These travel expenditures can be broken down by travel-related industry groups in the following subcategories:

- Public Transportation – Air transportation, taxicab companies, interurban and rural bus transportation, passenger transportation and water passenger transportation.
- Auto Transportation – Gasoline service stations, passenger car rental, motor vehicle/parts dealers, automotive repairs and maintenance.
- Entertainment and Recreation – Entertainment, art and recreation industry
- Lodging – Hotels, motels, and motor hotels, camps and trailer parks.
- Foodservice – Eating and drinking places and grocery stores.
- General Retail Trade – General merchandise group stores and miscellaneous retail stores, including gift and souvenir shops, and other retail shops.
- Travel Arrangement Industry – Travel agencies, tour operators, and other travel arrangement and reservation services.

In Massachusetts, $6.4 billion was directly spent in public transportation and auto transportation expenditures totaled $2.4 billion. Together, the direct expenditures in

transportation in 2017 was $8.9 billion, or 38.8% of total direct expenditure. Lodging, represented a 25.5% of total travelers' expenses.

Whether it is by air, sea or land, transportation modes are frequently used as the means to get to and from a destination, or part of the experience at a given destination. According to the Massachusetts Office of Travel and Tourism (MOTT) Table III-3 shows the majority of domestic travelers, 72.3%, drive their own vehicle to Massachusetts, whereas air travel represents 14.2%.

Table III–3: Domestic Visitor Transportation Mode, FY2017

Mode	Percent
Own Auto /Truck / Motorcycle	72.3%
Airplane	14.2%
Rental Car	5.7%
Train	1.8%
Bus	1.5%
Ship / Boat	0.9%
Camper / RV	0.7%
Motorcoach	0.3%

Source: Massachusetts Office of Travel and Tourism 2017 Annual Report (2018).

Massport Traffic Metrics for the Boston-Logan International Airport reports a total of 39,506,509 passengers in FY2018. Of these, 19,636,213 were enplaned passengers (excluding general aviation enplanements). Domestic passenger enplanements are comprised of 76.4%, international enplanements 18.4% and regional enplanements were 5.2%. The primary carrier was JetBlue Airways, carrying a 27.9% of all passenger traffic, followed by American Airlines with a 16.2% share of all passenger traffic. Air carriers with a foreign flag carried 14.2% of all passenger traffic. Boston-Logan International Airport is the most active airport in the New England Area and it is ranked 17th in North America based on passenger volume.[9] Boston-Logan International Airport generated approximately $695 million of operating revenue.

Within the planning region, the Worcester Regional Airport had a total of 53,931 enplanements in CY2017, ranking third in passenger volume after Boston-Logan International Airport and Nantucket Memorial Airport. Massport reports a total of 33 employees working at the Worcester Regional Airport in FY2018 and generated $1.8 million in operating revenue. JetBlue

[9] Source: Massachusetts Port Authority 2018 Comprehensive Annual Financial Plan. Retrieved at: http://www.massport.com/media/3029/mpa-fy18-cafr-final.pdf

and American Airlines offer daily departures to four destinations including Orlando International Airport, Fort Lauderdale Hollywood International Airport, New York's JFK International Airport and Philadelphia International Airport. Delta Airlines will start operations in August 2019 with daily flights to Detroit. Current daily trips provide access to over 120 destinations. Massport forecasts an increase in the number of passengers at the Worcester Regional Airport in the next five years. The goal is to accommodate 400,000 annual passengers.

The Worcester Regional Airport has accessible parking with lower fares when compared to Boston-Logan International Airport. The WRTA's Route 2 provides hourly service to the passenger terminal, several car rental companies are located within the premises, taxis and transportation network companies are also readily available. The airport's access and road condition are considered suitable for the current and projected daily volume of passengers.

Travelers Activities and Regional Attractions

Domestic travelers, whether it is for leisure or business, comprise the largest group of visitors to the Commonwealth (93.7%). According to MOTT, in FY2018 the total domestic trips to Massachusetts were 26.1 million person-trips. Of these, 31.1% were from Massachusetts, 57% were from New England States and 21.6% from Mid-Atlantic States. Moreover, MOTT reports that the primary purpose was visiting friends and/or relatives (46.3%). Shown in Table III-4, the top activities were visiting relatives / friends (42.5%), shopping (22.6%), and fine dining (14.4%).[10] International travelers totaled 1,730 million person-trips. The top four origin countries to visit Massachusetts are Canada, United Kingdom, China and Germany.

Table III-4: Domestic Visitor Top 10 Activities in FY2017

Activities	Percent
Visiting relatives / friends	42.5%
Shopping	22.6%
Fine Dining	14.4%
Beaches	12.0%
Urban Sightseeing	10.8%
Rural Sightseeing	10.7%
Museums	10.7%
Historical Places / Churches	10.6%

[10] Source: MOTT Travel Stats Newsletter, February 2019. Retrieved at Massvacation.com

Activities	Percent
State / National Parks	9.6%
Art Galleries	5.4%

Source: Massachusetts Office of Travel and Tourism 2017 Annual Report (2018).

The tourism industry caters to different markets, population segments and trends. The CMMPO region is vast in attractions that cater to a large variety of travelers. Some of the market niches in the region are:

- **Adventure Tourism** – It is a type of niche tourism, involving exploration or travel with a certain degree of risk (real or perceived), and which may require special skills and physical exertion. This may include activities such as mountaineering, trekking, bungee jumping, mountain biking, skiing, cycling, canoeing, scuba diving, rafting, kayaking, zip-lining, paragliding, hiking, exploring, sandboarding, caving and rock climbing.
- **Agritourism** – Any agriculturally-based operation or activity that brings visitors to a farm or ranch. It refers to farm stays, buying produce direct from a farm stand, picking fruit, navigating corn mazes, feeding animals, among other activities.
- **Rural Tourism** – focuses on actively participating in a rural lifestyle. It can be a variant of ecotourism. It can include visits to villages or rural communities.
- **Sports Tourism** – Refers to travel which involves either observing or participating in a sporting event. There are three types of sports tourism:
    - Sports Event Tourism (visit a city to watch events)
    - Celebrity and Nostalgia Sport Tourism (visiting hall of fames or meeting with sports celebrities)
    - Active Sport Tourism (people who participate in a sport or competition including playing at golf courses).
- **Cultural Tourism** – Includes tourism in urban areas, particularly historic or large cities and their cultural facilities such as museums and theatres. It can also include tourism in rural areas showcasing the traditions of indigenous cultural communities (i.e. festivals, rituals), and their values and lifestyle, as well as niches like industrial tourism and creative tourism.
- **Craft Beer Tourism** – A fairly new trend ("Beercation") in the tourism industry that focuses on beer tasting activities, including Beer Festivals, Beer Trails, or beer-centric culinary experiences.
- **Recreational Drug Tourism** – Refers to the type of travel for the purpose of obtaining or using drugs for recreational use that are unavailable, illegal or very expensive in one's

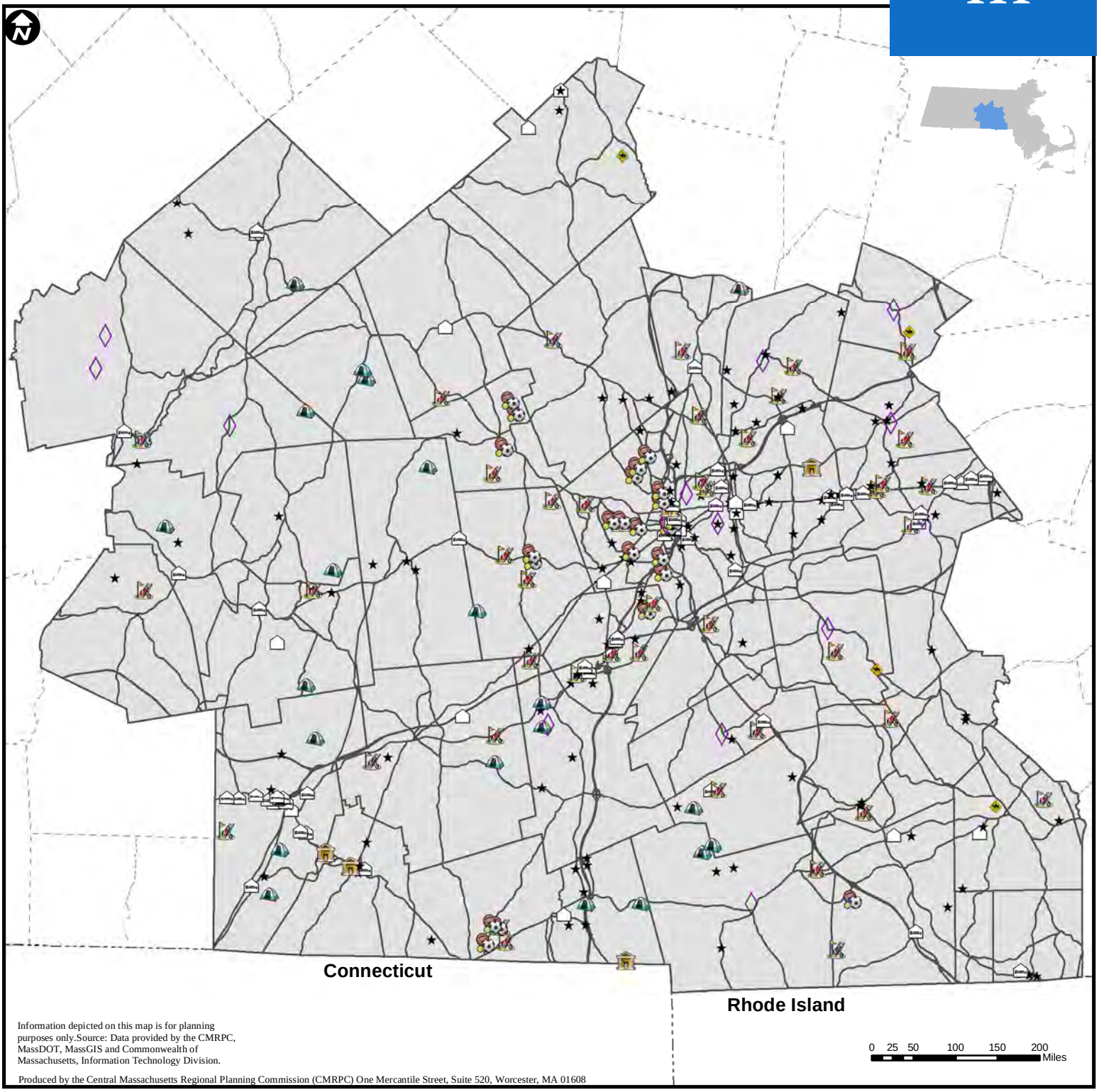
home jurisdiction. A drug tourist may cross a national border to obtain a drug that is not sold in one's home country, or to obtain an illegal drug that is more available in the visited destination. A drug tourist may also cross a sub-national border (from one province/county/state to another) in order to purchase alcohol or tobacco more easily, or at a lower price due to tax laws or other regulations.

Within the CMMPO region, the major tourist attractions offer nature-based activities, including farming, art and culture appreciation, sports events and conventions. See Table III-5 below. And Figure III-2: Tourist Attractions in the CMMPO region for more details.

Table III-5: Major Tourist Attractions in the CMMPO Region by Attendance in FY2017

Attraction	Community	Attendance in 2017
Wachusett Mountain Ski Area	Princeton	525,000
Southwick's Zoo	Mendon	500,000
DCU Center	Worcester	468,570
Old Sturbridge Village	Sturbridge	253,087
Mechanics Hall	Worcester	250,000
The Hanover Theater and Conservatory for the Performing Arts	Worcester	241,000
EcoTarium	Worcester	176,559
New England Baseball Complex	Northborough	150,000
Worcester Railers HC	Worcester	150,000
Tower Hill Botanic Garden	Boylston	119,754
Worcester Art Museum	Worcester	108,331
Hanover Insurance Park at Fitton Field	Worcester	72,928
Hart Center at the Luth Athletic Complex	Worcester	56,028
Indian Ranch	Webster	45,000
Fitton Field (Football)	Worcester	36,001
Escape Games Worcester	Worcester	20,500
Vaillancourt Folk Art	Sutton	18,400
Worcester Historical Museum	Worcester	7,242

Source: Worcester Business Journal Data Center. Book of Lists, 2018.



CMMPO

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Figure III-2 Tourist Attractions in the CMMPO Region

Type

- Sports field
- Recreation
- Museum
- Hotel
- Historical
- Golf
- Event Venue
- Equestrian
- Camp
- CMRPCTowns

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As of March 2019, the Executive Office of Labor and Workforce Development's (EOLWD) Labor Market Information Employer Locator tool included 59 hotels, 22 camp sites, and 47 golf courses or practice ranges in the CMMPO planning region. From branded hotels, to bed and breakfast (B&B), and rural accommodations, the region offers a wide array of options for accommodations. Camp sites are mainly located in State Parks, private-ownership camp sites and camp sites with facilities for RVs or camper vans. Related with golfing, the region has multiple country clubs or municipal golf facilities. Also, some communities have driving ranges, putting greens or mini-golf activity centers.

Furthermore, Central MassGrown farm inventory includes 49 farm locations, including farm stays (B&B), pick-your-own farms, maple sugar houses, organic farms, Community Supported Agriculture (CSA) farms and farm stands, among other types. In addition to this, several communities within the CMMPO region host agricultural fairs attracting a high volume of visitors.

Potential Next Steps

The various potential projects emerging as a result of integrating travel and tourism needs into the activities of state-level and regional transportation agencies spanned the following categories:

Attractions

Attractions in the CMMPO planning region include scenic byways, like the recently completed Route 122 Scenic Lost Villages Byway that crosses the towns of Barre, Oakham, Paxton, Petersham, and Rutland. Other major attractions that are frequently visited are like sports venues, convention centers, museums and farms. Since the data shows that the majority of the visitors use the auto travel to these attractions it is recommended to identify potential ways in which access to these attractions could be improved and to explore the desirability to develop a transportation management plan for each of the top three attractions in the region.

Access

Trails and heritage trails (including bicycle and pedestrian facilities), represent a great asset to promote access to various attractions within the CMMPO region that are mostly nature-based attractions. It is recommended to identify potential access to tourist attractions through the region's trails network.

Traveler Information Systems

Signage, variable-messaging systems, 511 traveler information services are some of the methods currently used to provide information to the traveling public and visitors. It is recommended to study the need for a visitor welcome center or kiosk with publications portraying the region's attractions. Information technology systems can also be used to let visitors know about real-time parking availability at park and ride facilities and other parking facilities.

Facility Operation and Related Improvements

Rest areas are crucial for visitors. It is recommended to study the current capacity and analyze the potential demand for rest areas facilities in major corridors within the CMMPO region. In the same fashion, it is recommended to evaluate the current capacity of park and rides within the region and analyze if the current inventory is sufficient for current and projected demand. Other improvements can be related to streetscapes and other transportation facilities.

A consideration should be placed on the need for charging stations either at service plazas within the CMMPO region or in potential improvements at rest areas and park and ride facilities. Potential corridors include I-84, I-495, I-395, I-190, U.S. 20 and MA-146. Once implemented, Massachusetts can pursue the designation of these corridors as an FHWA Alternative Fuel Corridor.

To keep enhancing the travel and tourism industry in the region, the CMMPO will pursue partnerships with local communities, economic development groups, Chambers of Commerce and tourism industry representatives in an effort to better understand the needs of the industry in relation to the transportation system and to reduce any negative effect that could arise from the transportation system on the tourism industry.

Transportation and Health

The focus on vehicle travel in transportation policy throughout the years has had a detrimental spillover effect on community health. Lack of access to transportation creates barriers to essential services including employment, health care, and nutritious foods. In addition, the cultural makeup and built environment of a community can either promote or inhibit healthy decision making in people's daily life. As a result, these social and physical determinants play a significant role in determining population health outcomes and the overall quality of life. Social determinants of health are conditions that exist where people

live, learn, work, play, and worship that affect health, functioning, and quality-of-life[11] which can include transportation options, public safety, health care services, and availability of resources or programs to support community living. Physical determinants are conditions that are a part of the natural and built environment such as community infrastructure, housing, physical barriers (ADA compliance), exposure to chemicals, toxins, and other hazards. Poor health outcomes are often made worse by the interaction between individuals and their social and physical environment.

Access to transportation is a social determinant that can facilitate or discourage healthy behaviors, while the condition of roadways is a physical determinant that also affects the community livelihood thereby impacting the quality of life. The US Department of Transportation (USDOT) recommends to use a holistic approach to health throughout the transportation planning process. This approach considers active transportation, safety, air pollution and access to opportunities for healthy life-styles. The USDOT and the Centers for Disease Control and Prevention (CDC) developed an online tool to easy access data related to health impacts of transportation systems. The tool also includes transportation and public health indicators for every US metropolitan area. Moreover, FHWA recently released a framework[12] to consider health in transportation corridor planning as a way to incorporate health into planning studies with the goal of promoting positive health outcomes and mitigate negative health outcomes from transportation policies, programs and projects.

The level of physical inactivity in the United States has become one of the most pressing health related issues facing our nation, and the CMMPO region is no exception to the problem. Research shows that obesity, cardiovascular diseases, diabetes and other chronic health conditions can be associated with lack of physical activity. Walking and cycling presents a low-cost option to begin to combat the issue. According to research reported in the British Medical Journal (April 2017), cycling to work has been associated with very large health benefits. Commuters who rode to work had a 41% lower risk of dying from all causes than people who drove or took public transport. They also had a 46% lower risk of developing and a 52% lower risk of dying from cardiovascular disease, and a 45% lower risk of developing and a 40% lower risk of dying from cancer. According to the Center for Disease Control (CDC), the prevalence of obesity was 39.8% and affected about 93.3 million of US adults in 2015-2016, while the rate

[11] US Department of Health and Human Services. Healthy People 2020. "Social Determinants of Health" 2015 https://www.healthypeople.gov/2020/topics-objectives/topic/social-determinants-of-health

[12] FHWA Health in Transportation Corridor Planning Framework available here: https://www.fhwa.dot.gov/planning/health_in_transportation/planning_framework/the_framework/fhwahep16014.pdf

was 18.5% in youth. Massachusetts fairs slightly better, with a 25.9% rate in adults and 11% in youth.

Obesity, hypertension, cardiovascular diseases, diabetes and asthma rates in the towns within the Central Massachusetts Regional Public Health Alliance (CMRPHA) service area[13] were comparable to Massachusetts, with the exception of Worcester, where the rates of these conditions were statistically higher. These health disparities are higher on traditionally underserved groups including minority populations, low-income families, and households in rural areas, veterans, faith-based groups, and people with disabilities. The Greater Worcester Community Health Assessment Report (CHA, 2018) found health disparities for chronic and complex conditions between Hispanic/Latinos and African-Americans compared to White individuals. Moreover, lack of transportation or the necessary transportation infrastructure can lead to unemployment, isolation, delayed healthcare, unhealthy diets, and malnourishment. Neighborhoods served by adequate transit access to more distant amenities connect residents to jobs, health care facilities, and other services throughout the community.

The CMMPO participated in the 2018 Greater Worcester Regional Community Health Assessment (CHA) as well as the 2017 Greater Worcester Region Community Health Improvement Plan (CHIP). The CMMPO is actively working in the implementation of several strategies included in the CHIP, as outlined within the Priority Areas of Access to Care; Physical Activity; and Economic Opportunity. The four strategies in which the CMMPO had been involved with identifying and designated to lead are the following: (1) Promote awareness of WRTA personal transportation services (PT1) among healthcare and health professionals; (2) Increasing participation of underserved populations in transit planning and advisory groups (3) Include a public health and wellness subsection in the next published Regional Transit Plan; and (4) Improve pedestrian network within 1/2 mile of the top 10 high activity transit stops.

Healthy Transportation Initiatives

Complete Streets

The Commonwealth of Massachusetts has proved itself to be a national pioneer of incorporating health into transportation policy. The Massachusetts Healthy Transportation Compact (HTC) was a key requirement of the landmark transportation reform legislation signed into state law in June 2009, an initiative resulting from the Deval Patrick Administration. The HTC was designed to facilitate transportation decisions that balance the needs of all

[13] The Central Massachusetts Regional Public Health Alliance (CMRPHA) service area include the towns of Grafton, Holden, Leicester, Millbury, Shrewsbury, West Boylston and Worcester.

transportation users, expand mobility, improve public health, support a cleaner environment, and create stronger communities. Various policies and inter-agency partnerships were established as the result of the HTC Advisory Council guidance and recommendations. In particular, the major product that resulted from the HTC was the Complete Streets Funding Program. Complete Streets, including bicycle facilities, are designed to be an important aspect of the livability of a community and region. The addition of bicycle facilities to the transportation network is a key part of creating networks for all users, increasing safety and system efficiency.

Through ongoing efforts with Walk Bike Worcester, the Safe Routes to School (SRTS) Taskforce, Transportation Advisory Group (TAG), Community Development Block Grant (CDBG) and downtown revitalization activities, CMMPO staff has been working toward the incorporation of Complete Streets policies and techniques in all transportation planning products and initiatives. For example, in an effort to coordinate Complete Streets priorities and CDBG infrastructure improvements, staff worked with the Town of Brookfield to develop a Complete Streets Prioritization Plan which included sidewalk projects along residential areas where planned CDBG activity will address ADA ramp repairs and other pedestrian safety improvements. The City of Worcester's Complete Streets Policy received one of the highest scores in the state, and CMMPO staff continues to be involved with Complete Streets Planning for the City through the Transportation Advisory Group (TAG). Upcoming efforts will involve working with the City and its stakeholders to assess current bicycle and pedestrian network conditions to identify priority improvements. See Chapter 4 for more information on bicycle and pedestrian planning.

Safe Routes to School (SRTS)

The Massachusetts Safe Routes to School (SRTS) Program promotes healthy, active transportation modes for children and their parents in their travel to and from school. It educates students, parents and community members on the benefits of walking and bicycling for travel to and from school. In the past, CMMPO staff has worked with *Walk Bike Worcester* on a pilot program for Safe Routes to School in the Worcester Public Schools System with a multimodal focus on the safety of schoolchildren in the City of Worcester. This work is an integral part of the Livability Program for the CMMPO and staff have continued to participate in an advisory role. Upcoming SRTS Taskforce efforts may include coordinating SRTS planning in the Town of Berlin and the Memorial Elementary School because the need was identified during Berlin's Complete Streets Prioritization Planning. CMRPC staff are also engaged with the Town of Holden as part of the town's Master Plan Update and are investigating a traffic signalization/congestion issue nearby the Early Childhood Center School to determine whether

Safe Routes to School planning approach could address the issue. Special focus will be paid to incorporating student participation into the development all projects.

Mass in Motion

Lack of multi-modal transportation options combined with food scarcity in small pockets of the region limits the ability of low-income and underserved populations to access affordable, high-quality, and healthy food. The Mass in Motion Program is a statewide movement that was launched in 2009 aiming to promote healthy eating and physical activity in order to prevent overweight and obesity. Mass in Motion provides grant funding, trainings, and other resources to cities and towns that enhance opportunities for people to eat healthier and move more in the places we live, learn, work, and play. According to a report by Feeding America, there are over 71,000 food-insecure households in Worcester County in 2018—approximately 1 in 11 people and 1 in 8 children. Mass in Motion is made up of several components and offers various levels of engagement including school nutrition standards, worksite wellness, childcare, and schools.

In the CMMPO region, several communities have participated in Mass in Motion activities that fall under the Municipal Wellness and Leadership Grant Program, which provides grant funding and technical assistance to over 60 cities and towns to engage in community-based obesity prevention efforts. The City of Worcester is a designated Mass in Motion Community. The *Mass in Motion Worcester* program is a multi-year partnership to address overweight, obesity and chronic disease through access to healthy food and physical activity opportunities at the local level. The Town of Northborough also participates in the Program as a member of *MetroWest Moves*, which is a multi-community partnership comprised of the towns of Framingham, Hudson and Marlborough.

In 2016, CMRPC staff received a grant from the Massachusetts Association of Health Boards (MAHB) to initiate Mass in Motion planning in three CMMPO communities including Barre, Blackstone, and Charlton. The project surveyed the towns and identified health indicators that provided insight into how well each of the communities promotes wellness in order to prioritize related components into their municipal planning efforts. The study results showed that *Access to Affordable and Nutritious Foods, Farmer's Markets, Farmlands* are three local assets noted across all communities. In contrast, *Access to Transportation, Sidewalk/Road Infrastructure and Accessibility*, and *Physical Activity* are three challenge areas prioritized for action and improvement.

Health impact Assessments (HIA)

A Health Impact Assessment (HIA) is an evidence-based process that engages the community, gathers health-related information, and identifies strategies to improve community and individual health. This process can foster the incorporation of both health and equity into community planning and engagement efforts and is used to identify potential health impacts of projects, plans, and policies. The CMMPO participated in the development of Union Hill's Health Impact Assessment (HIA) Report, an effort lead by the City of Worcester Division of Public Health and funded by the Massachusetts Department of Public Health in 2013 to assess the health effects of a future neighborhood's revitalization. The Union Hill neighborhood experiences higher crash rates, especially involving pedestrians, and higher rates of pedestrian injury than the city as a whole. The HIA recommended the implementation of a Complete Streets program to guide street and sidewalk investments in the neighborhood. More recently, the CMMPO staff recommended the development of a HIA for MassDOT's Kelley Square improvement project and all the related development happening at the area.

Other initiatives

At the request of City Manager Edward M. Augustus of Worcester, CMMPO staff were asked in fall 2018 to research and identify potential parking areas for construction employees, patrons, and residents during the upcoming construction of the "Polar Park" Ballpark and Kelley Square Redesign. In addition, staff were asked to make field observations and research areas suitable for storage of materials or heavy equipment and potential parking areas for Polar Park patrons, including parking for up to 50 busses, once construction is complete in 2021.

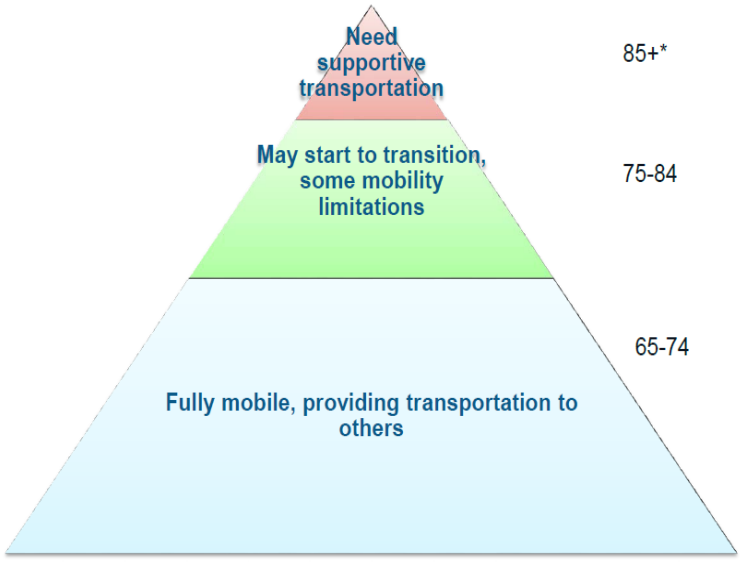
Healthy Aging and Transportation

During the spring of 2018, researchers at the University of Massachusetts Boston Gerontology Institute with the financial support of the Tufts Health Plan Foundation, published the report titled *A Scan of Transportation Options Available for Older People in Massachusetts*. The study was derived from *The Governor's Council to Address Aging Issues in Massachusetts*, Executive Order 576, which established workgroups in 2017 to focus on several key areas: caregiving, employment, housing, and transportation. The transportation workgroup recognized that to make informed recommendations it needed a thorough understanding of the transportation services available to older people in Massachusetts. As a result, the project team conducted a scan of transportation services in the state and examined national best practices and successful models. The study found that similar to

housing needs, transportation needs for seniors vary based on the individual's age or physical capabilities and are spread across different levels.

The study found that the older population is very heterogeneous and underscores common misconception that there is a single transportation problem or solution when planning for the 65+ population. There is a group of older adults that are fully mobile and may provide rides to others. There is another group with some mobility limitations who are starting to transition to more supportive transportation options. And there is a group of adults who need fully supportive transportation options (See Figure III-3).

Figure III-3: Transportation Needs for the 65+ Population

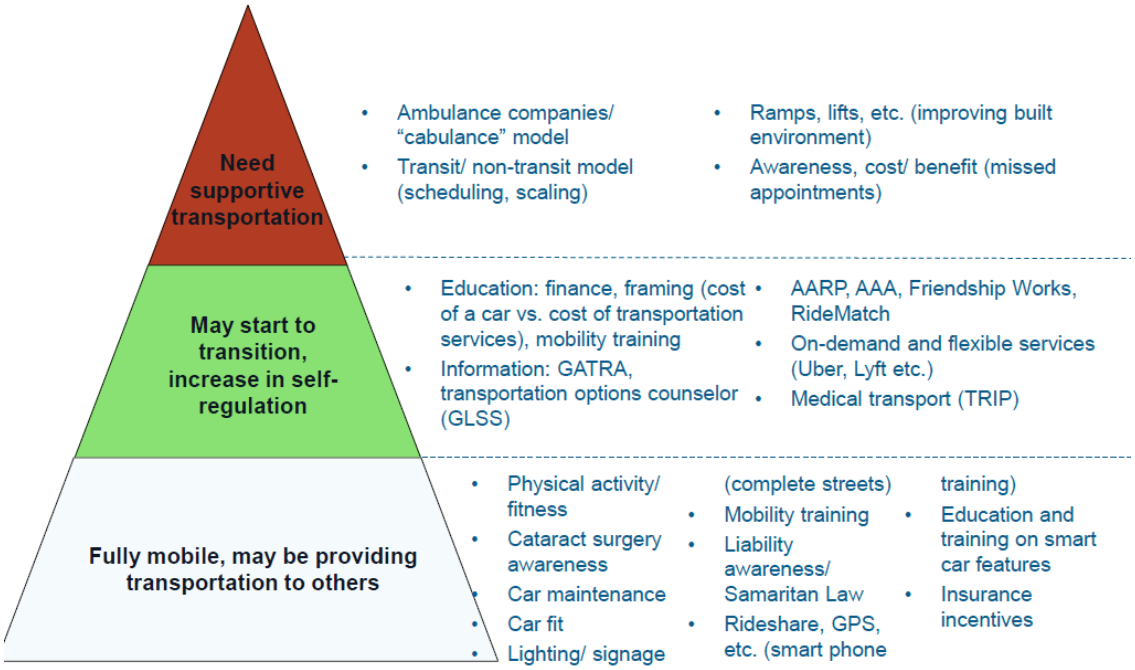


Some of the recommendations included in the study are:

- Take steps to ease the transition to non-driving and to supportive transportation options.
- Expand transportation choices to help aging population achieve their mobility needs through Complete Streets for roadways, pedestrian network, SRTS planning for any senior housing units nearby schools
- Develop and distribute resources and tools to support safe driving skills and encourage early planning to safely transition from driving. For example, local COAs can partner with the AARP-Massachusetts Chapter to organize Driver-Safety courses and trainings led by other older adults.

In summary, the study revealed the need to innovate in the transportation arena to respond to the older adults needs. (See Figure III-4).

Figure III-4: Matching innovation to Opportunity in MA



Source: Transportation workgroup, Governor's Council to Address Aging Issues.

Planning Ahead

The CMMPO will continue to work on the CHIP implementation and will provide support to initiatives related to transportation that improves the health of the region's population, especially those that are centered in improving and expanding the pedestrian and bicycle infrastructure in the region. The work done so far has helped to strengthen the organization's network with the City Division of Public Health, local non-profits, service providers and the community at large, expanding the CMMPO's stakeholder base. Health is definitely a topic that will shape transportation policy in the immediate future. The MassDOT Complete Streets Program is one example of how these two sectors have successfully shaped health-focused urban planning across the region.

The CMMPO foresees more staff training in the future related to these matters since it is an evolving topic. As standard procedure, the CMMPO will continue analyzing regional and local data through our local partners. Staff will work on incorporating the Integrated Health and Transportation Impact Modeling (ITHIM) tool to assess impacts of active transportation and policy on health in order to help inform future investments. The tool uses local and regional model outputs to estimate changes in physical activity, road traffic injury risk, and exposure to fine particulate matter air pollution. Currently the ITHIM tool is utilized in research and by health and transportation professionals to estimate the health impacts of scenarios, compare

the impact of travel patterns in different areas, and model the impact of improvements or interventions. Particular attention will be placed in education and information sessions as a way to reduce fatalities and serious injuries.

In relation to livability in the TIP, the CMMPO developed a draft TIP livability scoring criteria that proved useful in evaluating potential 2019-2023 TIP project candidates. Also, the CMMPO has been involved with several livability-related projects and initiatives, including Safe Routes to School Activities, Neighborhood SAFE and "Complete Streets", among other initiatives.

Access to Essential Services

Policy Background

The U.S. DOT through the joint FHWA - FTA Planning Emphasis Areas (PEAs) is guiding state DOTs and MPOs' transportation planning work. A principal PEA is Access to Essential Services - specifically identifying connectivity gaps in access to essential services. Accessibility, or the ability to reach essential services, is fundamental in a sustainable, equitable and multi-modal transportation system. Essential services or activities include: emergency services, health care, public services, education, employment opportunities, access to food and to social and recreational activities.

Moreover, the Access to Essential Services PEA also refers to ADA compliance, effectiveness of public participation, pedestrian and bicycle facility assessments as well as the availability of a coordinated human service transportation plan.

Accomplishments

The CMMPO has been working to identify transportation connectivity gaps for several years now. One of the major undertakings related to this effort is the Regional Data Management System, with the road segments along Federal-Aid eligible roads as the primary unit. Sidewalk condition and curb ramps are included in the CMMPO annual data collection efforts. The inventory includes information related to the availability and condition of the ramps and if they are in compliance with ADA regulations or not.

The sidewalk and ramp inventories are the foundation for the CMMPO 2018 Regional Pedestrian Plan and the Regional Bicycle Plan. One of the objectives in both plans is to identify opportunities to improve the regional pedestrian and bicycle network. An extensive public participation process and a survey were completed during each Plan's development process. Each Plan included a "hot spot" map with origin and destination information based on locations

mentioned through the public participation process that are essential to access to. These maps are a reference tool for prioritizing bicycle and pedestrian projects in the region.

Moreover, pedestrian and bicycle facilities have been assessed in multiple locations throughout the region. Various CMMPO programs offer the opportunity to look at pedestrian and bicycle infrastructure from different viewpoints. For example, Road Safety Audits (RSA) are a requisite for highway projects that are HSIP-eligible. The RSA's assess the location from a multimodal approach. Recommendations to improve pedestrian and or bicyclist accommodations are included in the RSA report for consideration in future road improvements. Another example related to safety, is the Chandler Street (Worcester) assessment completed in 2016. The segment assessed included one of the top pedestrian high crash locations in Massachusetts in an Environmental Justice neighborhood. MassDOT, WalkBoston and MassBike, along with the City of Worcester and the Worcester Police Division, participated in the CMMPO-facilitated assessment.

Also, MassDOT's Complete Streets Program is another opportunity to improve access to essential services. Almost 50% of the CMMPO communities have applied to MassDOT to participate in the Program. At different levels of development, the Complete Streets Program allows for identification of those areas that will be prioritized and treated as Complete Streets, allowing for improvements in pedestrian and bicycle accommodations closing the gap in local connectivity.

Transit gaps are also identified through current CMMPO work. An extensive public outreach effort took place to discuss WRTA service changes, which provided key information on the locations deemed more important for the transit users. In addition, every year, the WRTA administers a survey to transit users and include several origin and destination questions, frequency and travel time among other questions that support the identification of transit gaps and needs. Staff also compares levels of existing fixed route services with access to specific destinations to monitor accessibility to essential services, and updates reports on connectivity and travel times. This information is used during specific service planning processes each fiscal year.

WRTA member communities, major employers, and educational/medical institutions also have a voice in the identification of transit gaps. As an example, community vans are now providing fixed-route transportation in the towns of Northbridge, Grafton and Westborough as the result of an existing need to connect local services and jobs with the MBTA Commuter Rail and WRTA fixed routes. WRTA fixed-route schedules are synchronized with MBTA Commuter Rail in peak hours as the result of formal consultation and completed surveys by human resources

personnel from major employment centers. In addition, the CMMPO staff's involvement in supporting MassDOT annual Community Transit Grant Program helps to fund mobility management alternatives or new routes deemed necessary for a underserved community or target population in the CMMPO region.

Furthermore, the Commonwealth's Executive Order 530, related to quality and efficiency of paratransit and community transportation, recommended the creation of Regional Coordinating Councils (RCC). The RCC is a voluntary advisory body that represents regional stakeholders with an interest in improving community mobility and developing collaborative solutions to existing gaps and barriers. The Central Mass RCC has worked to identify the unmet needs in the region including access to jobs and services in rural areas. An example of this is the RCC support on the creation of the Quaboag Connector. The pay-for-ride service in the rural towns of Brookfield, East Brookfield, Hardwick, West Brookfield, Ware, Warren, Belchertown, Monson and Palmer offer a new service connecting the WRTA and the PVTA service areas. The RCC is currently updating its Coordinated Human Service Transportation Plan.

The staff continues to meet with the long-standing Transportation Planning Advisory Group (TPAG), and since Mobility2040 was written, with new groups (WRTA RAC and TAC). These groups, while they each have unique priorities, share a common interest in identifying and addressing unmet transportation needs.

Planning Ahead

The CMMPO will continue to identify and address accessibility gaps with special attention to Environmental Justice populations, as well as to address such gaps in areas with a higher percentage of zero-vehicle households and/or higher percentage of elderly individuals. The Regional Pedestrian and Bicycle Plans will be used as the go-to reference for project or service prioritization based on local input, in tandem with the Complete Streets Program.

Safety is one of the CMMPO backbone programs. The CMMPO has programmed federal Highway Safety Improvement Program (HSIP) funding to implement several major transportation safety improvements. The CMMPO expects to continue identifying and prioritizing HSIP funds for projects or project components at various locations throughout the region, advancing the metrics identified in the performance measures. RSA's and pedestrian and bicycle assessments are essential tasks within this program.

For transit, the CMMPO staff will continue working with the WRTA to engage transit users in regular participation in various advocacy groups, attendance in public meetings, and conduct surveys. Staff will also pursue MassDOT's annual Community Transit Grants in order to continue

closing the gap between what is currently being offered with the demand for more service. Likewise, staff is updating the region's Coordinated Human Service Transportation Plan on behalf of the RCC, which will identify current unmet needs and the potential solutions to address them.

Climate Change and Resiliency

Climate change and extreme weather events are disrupting transportation systems across the country. Examples of climate changes and their effects are:

- Temperatures are rising – higher temperatures make winters shorter, growing season longer coupled with more dangerous heat waves and drought.
- Changing precipitation – average annual precipitation in the Northeast increased 10 percent from 1895 to 2011 and rainfall from intense heavy storms has increased 70 percent since 1958. [14]

Federal, state, and local transportation planners are considering the range of impacts that climate variability and climate changes may have on transportation assets. Transportation systems have mostly been built to withstand weather under the current and past climate. Unfortunately the Northeastern United States is experiencing more frequent extreme weather events that damage roads and bridges. Repairs to our transportation networks are costly to repair, not to mention the cost to the economy from disrupted travel. What has been considered extreme weather will be more commonplace in the future and it is vital that states and regions improve the resiliency of their transportation systems by integrating climate change considerations into agency actions.

These climactic challenges facing the transportation industry has introduced strategies and legislation to mitigate the effects of extreme weather on our nation's infrastructure. The FAST Act, signed into federal law in December 2015, requires agencies to take resiliency into consideration during the transportation planning processes. Federal Highway Administration and Federal Transit Administration have also updated the metropolitan and statewide planning regulations to reflect these new requirements under the FAST Act. At the center of this new planning rule is improving the resiliency and reliability of the transportation system.

Resilience is the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions. [15] With regards to planning,

[14] https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-ma.pdf
[15] https://www.fhwa.dot.gov/environment/sustainability/resilience/publications/ratp/index.cfm

resilience also determines the level of functionality after the event and to the restoration time to return to normal operation.

Policy Background

One of the major causes of climate change is from the combustion of fossil fuels and human activities that have increased the atmospheric concentrations of Greenhouse Gases (GHG). Not only do GHG emissions contribute to climate change, it also contributes to the overall air quality of a region. In the Northeast, the transportation sector is the largest source of heat-trapping emissions followed by electricity generation.[16]

In an effort to slow down the release of GHG into the atmosphere, thus speeding up the rate of climate change, federal and state partners have introduced legislation and policies that must be incorporated into our transportation planning. The following chart breaks down these new requirements on the federal and state level. See Figure III-5.

The Commission on the Future of Transportation recommends to substantially reduce greenhouse gases (GHG) emissions from the transportation sector by establishing a market-based (cap-and-invest) program, adopt a regional Low Carbon Fuel Standard (LCFS) and achieve the goal of all new car-electrification by 2040. Moreover, the Commission recommends to design new infrastructure with climate change and resilience in mind and existing infrastructure needs to be retrofitted to withstand the impacts of climate change. The recommendation also indicates that Commonwealth funds should only be allocated to projects that are designed to be resilient.

[16] https://www.massaudubon.org/content/download/16069/238377/file/confronting-climate-change-in-the-u-s-northeast.pdf

Figure III-5: Federal and State Legislation and Policies

REQ.	Effective Date	Overview	Source
FEDERAL	27-Jun-16	"(a) Each State shall carry out a continuing, cooperative, and comprehensive statewide transportation planning process that provides for consideration and implementation of projects, strategies, and services that will address the following factors: (9) improve the resiliency and reliability of the transportation system and reduce or mitigate stormwater impacts of surface transportation."	23 CFR 450.206(a)
	27-Jun-16	"(b) The metropolitan transportation planning process shall be continuous, cooperative, and comprehensive, and provide for consideration and implementation of projects, strategies, and services that will address the following factors: (9) Improve the resiliency and reliability of the transportation system and reduce or mitigate stormwater impacts of surface transportation;"	23 CFR 450.306(b)
	1-May-18	"(c) The long-range statewide transportation plan shall reference, summarize, or contain any applicable short-range planning studies; strategic planning and/or policy studies; transportation needs studies; management systems reports; emergency relief and disaster preparedness plans;"	23 CFR 216 (c)
	27-May-18	"(f) The metropolitan transportation plan shall, at a minimum, include: 7) Assessment of capital investment and other strategies to preserve the existing and projected future metropolitan transportation infrastructure, provide for multimodal capacity increases based on regional priorities and needs, and reduce the vulnerability of the existing transportation infrastructure to natural disasters.	23 CFR 450.324(f)(7)
	2-Oct-17	Asset Management Plan (c) A State DOT shall establish a process for developing a risk management plan. This process shall produce the following information: (6) Risk management analysis, including the results for NHS pavements and bridges, of the periodic evaluations under part 667 of this title of facilities repeated damaged by emergency event. and (h) A State DOT shall integrate its asset management plan into its transportation planning processes that lead to the STIP, to support its efforts to achieve the goals in paragraphs (f)(1) through (4) of this section.	23 CFR 515.7 (c)(6) and 515.9 (h)
	Due by November 23, 2018	State DOTs must evaluate facilities that have repeatedly been damaged in emergency events.	FAST Act 23 CFR 667
	Nonbinding	The National Highway Freight Program has a goal to "improve the . . . resiliency of freight transportation in rural and urban areas."[1]	FAST Act
	Nonbinding	Goals for the national transportation system include increasing safety, security, and reliability.[2]	MAP-21
	Nonbinding	National Infrastructure Protection Plan invests to produce significant reductions in national risk. [3]	Homeland Security
MASSACHUSETTS	2002 and updated on November 25, 2014	Article 97 of the Constitution of the Commonwealth of Massachusetts provides that the "people shall have the right to clean air and water, freedom from excessive and unnecessary·noise, and the natural, scenic, historic, and esthetic qualities of their environment; and the protection of the people in their right to the conservation, development and· utilization of the agricultural, mineral, forest, water, air and other natural resources "is hereby declared to be a public purpose";	Executive Order on Environmental Justice, Order Number 552
	16-Sep-16	MA Executive Order 569, "Establishing an Integrated Climate Change Strategy for the Commonwealth," directs executive agencies to develop and implement a statewide Climate Adaptation Plan, and to build a framework for each state agency and municipality in Massachusetts to assess their vulnerability to climate change. Section 3 states that the Secretary of Energy and Environmental Affairs and the Secretary of Public Safety are to coordinate efforts across the Commonwealth to strengthen the resilience of communities, prepare for the impacts of climate change, and to prepare for and mitigate damage from extreme weather events.	Executive Order Number 569
	23-Jan-18	MA Executive Order 579, "Establishing the Commission on the Future of Transportation in the Commonwealth," creates a commission that at a minimum investigates the following topics that are critical to laying a foundation for understanding anticipated changes in population, employment, and demographics in Massachusetts as well as forthcoming developments in transportation-related technologies, energy use, climate change and other factors that may affect transportation: Climate and Resiliency, Transportation Electrification, Autonomous Vehicles, Transit and Mobility Services, Land Use and Demographics.	Executive Order Number 579
	Aug-08	The Global Warming Solutions Act (GWSA) required the Executive Office of Energy and Environmental Affairs (EOEEA), in consultation with other state agencies and the public, to set economy-wide greenhouse gas (GHG) emission reduction goals for Massachusetts.	GWSA
	27-Jul-17	Air pollution control for mobile sources and GWSA requirements for transportation. MassDOT is required to demonstrate its aggregate MassDOT emissions reduction limits as established in 310 CMR60.06(6) are achieved. MPOs are required to evaluate and report the aggregate transportation GHG emissions impacts of RTPs and STIPs.	310 CMR 60.05

Performance Management

Required by MAP-21 in 2012 and built on by the FAST Act in 2015, the U.S. Department of Transportation developed a series of rules that incorporate Performance-Based Planning and Programming (PBPP) into the Federal-aid program to support the seven national goals:

1. Safety
2. Infrastructure Condition
3. Congestion Reduction
4. System Reliability
5. Freight Movement and Economic Vitality
6. Reduced Project Delays

The Performance Management Ruling related to mitigating the effects of climate change via reduction in GHG is PM 3, the On-Road Mobile Source Emissions Measure. This measure is an assessment of the Congestion Mitigation and Air Quality Improvement (CMAQ) program through measurement of total emissions reduction of on-road mobile source emissions.[17]

In addition to this Federal Rule, the Commonwealth of Massachusetts' 2008 Global Warming Solutions Act (GWSA) includes regulations specifically targeted to the transportation sector. The regulations require MassDOT to:

- Require MPOs to evaluate and track GHG emissions and impacts of their plans
- Demonstrate achievement of GHG reduction commitments and targets in the Clean Energy and Climate Plan

Chapter 2 discusses how the CMMPO addresses PM 3 and continually works with MassDOT to reduce GHG in order to meet the GWSA requirements. The CMMPO also tracks two regionally customized measures that are related to mitigating climate change through reducing GHG and managing stormwater for infrastructure resiliency.

Stormwater Management and Infrastructure Resiliency

Extreme and more frequent rainfall events affect transportation infrastructure by disrupting public travel safety, commercial transport of goods and services, and natural resources including water quality.

Each of the 40 communities in the CMMPO region will be confronted with the most effective way to handle stormwater. Transportation impacts from stormwater can range from traffic

[17] https://www.federalregister.gov/documents/2017/01/18/2017-00681/national-performance-management-measures-assessing-performance-of-the-national-highway-system

disruptions to flooded evacuation routes to weather-related mass transit delays. Communities should also consider the structural, operational and safety impacts to roadways, bridges and culverts, as well as overall impact on the system capacity.

The CMMPO is addressing Stormwater and Infrastructure Resiliency by developing a Nature-Based Solutions (NBS) Toolkit for Transportation Planning and have created metrics related to stream connectivity with an inventory of poor performing culverts. Additionally, the CMMPO is encouraging all 40 communities in the region to incorporate NBS approaches in their local ordinance.

Furthermore, the Transportation Improvement Program (TIP) also provides an opportunity to address stormwater mitigation improvements. As an example, in West Boylston, a section of Sterling Street, between Route 12 and Route 140 by the Wachusett Reservoir was recently rehabilitated (Project ID 607734). A major component of the project was to provide stormwater mitigation for direct discharges to the Wachusett Reservoir, among other improvements. Also Project ID 608043 in the towns of Boylston and West Boylston included drainage improvements along Route 140 with the same goal as the aforementioned project. The funding source for both projects was the Surface Transportation program (STP) funds.

Other projects in the CMMPO region with stormwater mitigation improvements are:

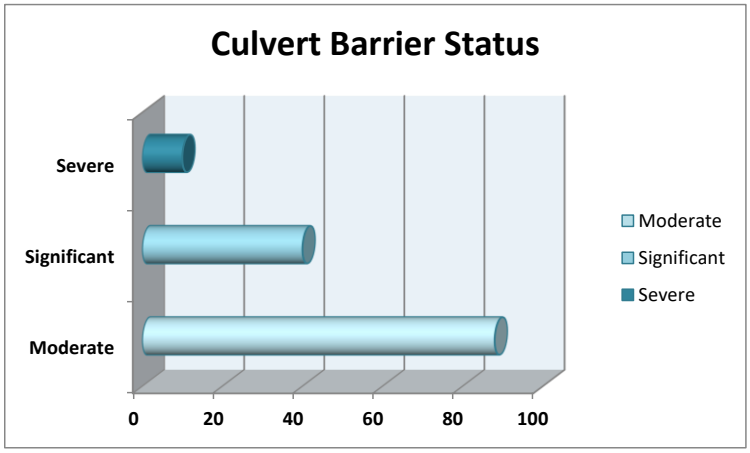
- Project 608133 in Hopedale and Uxbridge along Route 140 and Route 146 to treat runoff from various roadways discharging to impaired waters, including Mill River and Blackstone River.
- Project ID 608394 in Sturbridge, to treat runoff entering Pistol Pond.

Culvert Status

Most of the culverts currently in place were designed with the principal objective of moving water across a road's alignment. Little consideration was given to ecosystem processes such as the natural hydrology, sediment transport, fish and wildlife passage, or the movement of woody debris. It is not surprising then that many culverts significantly fail to achieve the movement of aquatic organisms.

Transportation networks and river systems share several things in common and connectivity is key to the continued functioning of both systems. Ultimately, the goal should be to create a transportation infrastructure that does not fragment or undermine the essential ecological infrastructure of the land. The CMMPO has an inventory of culverts in the region and it includes the extent of deficiency: moderate, significant or severe. Figure III-6 shows a graph with the amount of culverts in moderate, significant and severe barrier status.

Figure III-6: Culvert Barrier Status



Similar to stormwater mitigation, there are some projects already completed in the CMMPO region or underway that addressed the issue of failing culverts and ecosystem connectivity:

- Project ID 604507 in Oxford. This project main goal was to replace Culvert 0-06-001 at Commins Road over the French River. This project was funded through the Bridge Replacement Program. In essence a two-barrel corrugated galvanized steel culvert was replaced by a pre-cast three-sided curb-to-curb bridge.

Projects in Preliminary Design Phase are:

- Project ID 606701 in Sturbridge (Route 20 and Snell Street).
- Project ID 608315 in Sturbridge (MassPike, Mile 76.1).
- Project ID 608456 in Upton (Milford Street).

Moreover, the Department of Fish and Game's Division of Ecological Restoration (DER) manages the Culvert Replacement Municipal Assistance Grant Program, which provides funds to replace culverts. The DER Program's main objective is to encourage municipalities to replace aging culverts with better designed crossings that meet improved structural and environmental design standards and flood resiliency criteria.

In 2017 three communities in the region received grants to replace culverts Brookfield, Princeton and Warren. See a brief description below:

- Brookfield was granted funds to replace a culvert on Rice Corner Crossing Road to improve connectivity of the headwater habitat, tributary to the Quaboag River, for the 1,400 acre Quacumquasit Wildlife Management Area.
- Princeton, funds were used to conduct field data collection, engineering and design, and permitting for a culvert replacement on the South Wachusett Brook. Replacing the

culvert on Ball Hill Road should improve Princeton's infrastructure and storm resilience by reducing flood impacts.

- Warren, funds were used to conduct field data collection, engineering and design, and permitting for a culvert replacement on Taylor Brook. Replacing the culvert on Walkeen-Koziol Road should provide passage for resident brook trout and other fish and wildlife, and improve Warren's infrastructure and storm resilience.

Dam Removals

Other DER projects in the region include dam removals. Dam removal is one way to restore riparian habitats and it is also a resiliency strategy, a nature based solution to manage stormwater. Currently the DER is exploring the Ware River Restoration and Wheelwright Dam Removal in Hardwick. In this project, the DER is partnering with a private landowner and the East Quabbin Land Trust to explore options for removal of the dam on the mainstream of the Ware River on the Hardwick / New Braintree border. This project will reconnect over 100 miles of mainstream and tributary habitat making it one of the most significant dam removals in Massachusetts history.

Also, the DER is investigating the potential removal of an aging dam at the confluence of the Quinapoxet River within the Wachusett Reservoir in West Boylston. Removal of the dam will restore passage for landlocked salmon and other resident fish moving into and out of the reservoir. In Barre, the Galloway Brook Restoration project is already completed. This project removed an aging dam from a small cold water stream that flows through MassAudubon's Cooks Canyon Wildlife Sanctuary.

Integrated List of Waters

Transportation can have a great impact in overall watershed water quality. A small impact on headwaters or smaller streams can grow in magnitude affecting hundreds of miles downstream to the ocean in the New England region. Addressing water quality of streams, rivers and lakes is a concerted effort between federal and state agencies, local governments and community partners. Major efforts have been done by the state in compliance with the federal Clean Water Act (CWA) which requires that each state must monitor the quality of its surface waters, assess their capacity to support designated uses and to identify, if possible, causes or sources of impairment.

In this regard, MassDEP issues the Integrated List of Waters (305(b)/303(d)) every two years. The Integrated List of Waters assess the use-attainment status for waters in watersheds or coastal drainage areas. The uses assessed are: Aquatic Life, Fish Consumption, Primary Contact

Recreation, Secondary Contact Recreation, Aesthetics, Sellfish Harvesting. The list is then broken down in 5 categories. Categories 1 to 3 refers to those waters whose designated uses are either supported or not assessed. Water exhibiting some type of impairment for one or more uses are considered Category 4. Category 5 are those waters that are impaired for one or more uses and requires a Total Maximum Daily Load (TMDL)[18] to restore water quality and attain designated uses and final approval from the Environmental Protection Agency (EPA). In the region, based on Massachusetts Year 2016 Integrated List of Waters there are 361 assessed water units in the region, 97 of which are category 5, thus requiring a TMDL.

MassDOT's Impaired Waters Program (IWP) performs statewide assessments on all waterbodies located on DOT properties, with special attention to those that discharge stormwater runoff to impaired waters in compliance with federal and state stormwater regulations. For this purpose MassDOT started a retrofit program with project-specific best management practices (BMPs) and also incorporates stormwater BMP's into programmed highway projects with an emphasis on removing impervious cover and phosphorous from the watersheds.

MassDOT's IWP construction project funds are provided through the Federal Highway Administration (FHWA) transportation improvement program. For FFY MassDOT advertised $6.6 million in stormwater improvements that will go toward stand-alone retrofit projects and programmed resurfacing projects where IWP BMP's are coupled with the resurfacing project. Funding has been allocated to construct stormwater BMPs as part of the IWP through FFY2023. All the projects are included in the MassDOT Stormwater Asset Database.

Current projects in the CMMPO region include the following:

- Project #608133 in Hopedale – Drainage repairs and improvements along Route 140 (Milford Road). The project includes an infiltration basin to reduce draining from Route 140 to Mill River. Estimated cost is $116,000.
- Project #607479 in Shrewsbury – The project that added four new infiltration basins to treat stormwater from I-290 prior draining to Lake Quinsigamond and Mill Pond. Estimated cost is $1,000,000.
- Project #606279 in Millbury and Worcester – The retrofit project to improve the existing BMP's to enhance water quality by increasing storage and effective impervious cover reduction from route 146 prior draining to Blackstone River. Estimated cost is $600,000.

[18] A Total Maximum Daily Load (TMDL) is a calculation of the maximum amount of a pollutant that a waterbody can receive and still safely meet water quality standards. http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/

- Project #605592 in Holland and Sturbridge – The project included 8 new infiltration basins to treat stormwater from Interstate Route 84 between Exit 1 and Exit 3 prior draining to Quinebaug River. Estimated cost is $1,800,000.
- Project #605588.1 and 605588.2 in Worcester – To address stormwater runoff from the I-190 Shore Drive overpass and points north on I-190 draining directly to Indian Lake. Phase 1 includes seven infiltration swales and two infiltration basins. Phase 2 includes five new infiltration basins to treat stormwater runoff from I-190 over Route 12 and Ramp B to an unnamed tributary. Estimated cost is Phase 1: $792,880; Phase 2 is $440,489.

In addition, MassDOT has formalized the Stormwater Management Plan process by requiring the completion of the Water Quality Data Form (WQDF) for all STIP transportation projects as part of the Early Environmental Coordination Checklist deliverable at the 25% design stage process. At this stage, MassDOT alerts the designer of those environmental impacts that need to be addressed and the requirements for BMPs based on waterbody status. Further in the process, by the 75% design stage, the designer is required to fill the form again and include the BMPs used that will address the needs identified earlier in the process. MassDOT keeps track of the efforts made for future water quality assessments in the project's area.

Evacuation Planning and Preparedness

Transportation security refers to both personal and homeland security. It includes the vulnerability to intentional attack and natural disasters as well as the associated evacuation procedures. The goal is to increase the security of the transportation system for both motorized and non-motorized users. In order to achieve that goal, CMRPC staff in conjunction with Montachusett Regional Planning Commission (MRPC) under the guidance of the Central Region Homeland Security Advisory Council (CRHSAC) completed an evacuation plan for all of Worcester County. Since then, cities and towns with the support of CMRPC and CMMPO staff are assessing the potential hazards, whether chemical or natural hazards and identifying potential critical infrastructure, services, systems or processes that could be hampered in case of a major emergency.

Hazard Mitigation Plans

Through the Federal Emergency Management Agency (FEMA) and the Massachusetts Emergency Management Agency (MEMA) Hazard Mitigation Grant Program, CMRPC was able to complete Hazard Mitigation Plans for the CMMPO communities. The main purpose of the plan is to help communities implement hazard mitigation measures following a Presidential major disaster declaration. The plans and the strategies included in them help reduce the

overall risk to residents and property and reduce the costs of disaster recovery. The towns of Blackstone, Douglas, Grafton, Holden, Hopedale, Mendon, Millville, Oxford, Paxton, Princeton, Sutton, West Brookfield and Westborough have Hazard Mitigation Plans completed and can be downloaded here: http://www.cmrpc.org/hazard-mitigation-planning

Moreover, CMRPC also provides technical assistance to communities that will like to participate on MEMA's hazard mitigation programs. MEMA manages two programs that allow communities to mitigate natural hazards, including flooding: the Pre-Disaster Mitigation (PDM) program and the Flood Mitigation Assistance (FMA) program. Eligible projects under the PDM include property acquisition and structure demolition, property acquisition and structure relocation, structure elevation, dry flood-proofing of non-residential structures, minor localized flood reduction projects, structural retrofitting of existing buildings, non-structural retrofitting of existing buildings and facilities, safe room construction, infrastructure retrofit, soil stabilization, installation of emergency generators, and hazard mitigation planning. A 25% non-federal match is generally required. Eligible projects under the Flood Mitigation Assistance (FMA) program include infrastructure protective measures, floodwater storage and diversion, utility protective measures, stormwater management, wetland restoration/creation, aquifer storage and recovery, localized flood control to protect a critical facility, floodplain and stream restoration, and water and sanitary sewer system protective measures. A variable non-federal match is generally required, and beneficiary structures must be insurable under the National Flood Insurance Program. More information about both programs can be found here: https://www.mass.gov/service-details/pdm-fma-grants

Municipal Vulnerability Preparedness (MVP)

The Executive Office of Energy and Environmental Affairs administers the Municipal Vulnerability Preparedness Program (MVP). The program's goal is to support municipalities in their planning for resiliency by completing vulnerability assessments and identifying climate change adaptation strategies.

A total of nine communities in the CMMPO region have the MVP designation: Spencer, Charlton, Holden, Blackstone, Mendon, Shrewsbury, Millbury, Grafton and Northbridge. The towns of West Boylston, Worcester, Leicester, Auburn, Sutton, Brookfield and Uxbridge are currently participating in the program. Once the towns receive the MVP designation they can access funds to improve resiliency. For example, in most of the plans flooding and precipitation are identified as major hazards. Among the priorities identified to address these hazards are to replace failing culverts and to incorporate nature-based solutions to manage stormwater.

It is important to recognize that the MVP also identifies other hazards, like extreme heat as a result of climate change, the impact on vulnerable population and critical infrastructure. Preparedness includes communications improvements with Emergency Management personnel, create partnerships beyond town borders, identify evacuation routes and potential risks, as well as develop outreach and education plans.

Evacuation Routes or Limited Access Highway Evacuation Routes

CMRPC has developed, with support from the Central Region Homeland Security Advisory Council (CRHSAC), emergency evacuation routes for the seven limited access highways in Central MA, not including the Mass Pike, I-90. The CRHSAC and CMRPC determined there was a need in the region to identify evacuation routes, particularly around major highways in the event of a closed or compromised highway interchange. The routes were developed with input from the towns and cities which would be affected if the routes were ever needed, as well as, the WRTA and Montachusett Regional Planning Commission. The alternate routes intent is to efficiently and effectively handle the redirected traffic around an incident and rapidly reenter the highway. The maps, available to download at the CMRPC website, show the preferred routes developed for each interchange in the region for the following highways, I-290, I-190, I-495, I-84, I-395, MA-146, and MA-2. More information here: http://www.cmrpc.org/limited-access-highway-alternate-evacuation-routes#node-1471

Flood-prone areas and vulnerable infrastructure

CMMPO staff completed two major tasks in an effort to identify the transportation facilities that are the most susceptible to flooding events. The first one was to identify the road segments located in flooded areas and the second task was to identify transit routes susceptible to service interruption due to a flooding event.

In both exercises, the official Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (FIRM) was used. FEMA's maps depicts the region's flood prone areas. FIRM maps are the basis for floodplain management, mitigation, and insurance activities for the National Flood insurance Program (NFIP). The primary risk classifications are the following:

1. 1-percent annual chance flood event
2. 0.2-percent annual chance flood event
3. Areas of minimal flooding risk.

The 1-percent annual chance flood event is also known as the 100-year flood area. The analysis only considered this risk classification. It is important to note that within this classification there

are a group of zones used by FEMA to designate the Special Flood Hazard Areas (SFHA) and for flood insurance purposes. The zones are the following:

1. A, AE, AH, AO, VE: 1% Annual Chance Flood Hazard
2. AE: Regulatory floodway
3. D: Area of undetermined flood hazard
4. X: 0.2% annual chance flood hazard or area with reduced risk due to levee

Shown in Table III-6, there are 3,091 overall road segments in the CMMPO region that intersect a flood zone (659.5 miles). Worcester has the highest number of road segments in flood-prone areas, 536 road segments, and equal to 57.1 miles. Charlton has the second highest number of miles prone to flooding, 42.1 miles followed by Sturbridge with 39.8 miles of road segments in flood prone areas. More analysis is yet to be performed regarding these locations, including the intersection with other critical infrastructure and environmental justice populations.

Table III–6: Road Segments in Flooding Areas by Towns

Town	Road Segments	Miles	Zone A	Zone AE	Zone AH	Zone AO	Zone X
Auburn	183	38.3	9.7	13.0	0	0	15.6
Berlin	95	34.7	0.4	15.3	0	0	19.0
Blackstone	47	6.0	2.6	2.4	0	0	1.1
Boylston	40	13.7	5.8	1.2	0	0	6.7
Charlton	149	42.1	11.9	14.4	0	0	15.8
Douglas	86	30.7	15.0	2.1	0	0	13.6
Dudley	92	24.7	6.6	9.0	0	0	9.0
Grafton	128	34.3	2.2	18.7	0	0	13.4
Holden	1	0.2	0.2	0	0	0	0
Hopedale	37	4.3	0.0	2.2	0	0	2.1
Leicester	77	19.6	11.0	5.0	0	0	3.6
Mendon	34	10.2	0.9	3.5	0	0	5.8
Millbury	172	31.7	1.7	18.8	0	0	11.2
Millville	14	2.0	0	0.9	0	0	1.1
Northborough	140	27.2	10.7	9.1	0	0	7.5
Northbridge	96	17.2	4.7	6.1	0	0	6.3
Oxford	87	33.3	5.8	19.9	0	0	7.6
Paxton	17	4.1	3.0	0	0	0	1.1
Rutland	1	0.7	0.7	0	0	0	0
Shrewsbury	141	21.5	9.9	6.7	0	0	5.0
Southbridge	185	29.5	7.7	10.8	0	0.2	10.8

Town	Road Segments	Miles	Zone A	Zone AE	Zone AH	Zone AO	Zone X
Spencer	35	10.0	6.6	2.4	0	0	1.0
Sturbridge	150	39.8	24.1	5.0	0	0	10.7
Sutton	82	18.6	8.0	4.3	0	0	6.3
Upton	91	21.6	8.3	5.5	0	0	7.8
Uxbridge	103	33.5	5.9	13.1	0	0	14.6
Webster	54	6.1	0.2	3.3	0	0	2.6
West Boylston	108	24.5	6.5	4.1	0	0	14.0
Westborough	110	22.6	10.1	9.2	0	0	3.3
Worcester	536	57.1	2.4	31.8	0.6	1.3	20.9
Total	**3,091**	**659.6**	**182.3**	**237.5**	**0.6**	**1.5**	**237.5**

Transit is an essential element in an evacuation event. The main purpose of the exercise was to identify potential critical areas during a flooding event that could disrupt the transit service. These disruptions have already occurred. In October 2016 transit service needed to be interrupted for few minutes during a flash flood event in Worcester. The GIS exercise is a first attempt to identify those transit routes or assets that are more prone to be impacted by a flooding event due to its location in relation with the flooding areas as identified in FEMA's FIRM map. Using the intersect geoprocessing tool, the CMMPO was able to identify the following WRTA routes as more prone to service disruptions due to a flooding event. The routes are the following: 2, 4, 6, 7, 8, 10, 11, 15, 19, 22, 25, 27, 29, 30, 31, 33, 42. While most of the flooding areas that affect the WRTA routes are primarily located in Worcester, in some cases, like Route 29, has segments in flooding areas in each one of the towns that this route traverses.

Moreover, staff measured the vulnerability based on the presence of Environmental Justice and other vulnerable populations as defined by the CMMPO. For this exercise, staff used the Census Block Groups with above the region's average and assigned a value of 3 for minority population, 2 for low income population; and 1 for each of the following: households with population 75 years of age or more, linguistic isolated households, zero-vehicle households and Hispanic population. Once combined, the routes that should be prioritized in a flooding event should be routes 27, 29 and 25. See Table III-7 below.

Table III-7: Route Segments in Flooding Areas and Census Block Groups with EJ Population

Route Number	Minority	Low income	HH 75+	LEP	Zero Veh HH	Hisp Pop	Total
27	3	2	1	1	1	1	9
29	3	2	1	1	1	1	9
25	3	2	0	1	1	1	8
7	3	0	1	1	1	1	7
19	3	0	1	1	1	1	7
30	3	0	1	1	1	1	7
33	3	0	1	1	1	1	7
4	3	0	0	1	1	1	6
8	0	2	1	1	1	1	6
11	3	0	0	1	1	1	6
15	0	2	1	1	1	1	6
31	3	0	0	1	1	1	6
42	0	2	1	1	1	1	6
2	3	0	1	1	0	0	5
6	3	0	1	1	0	0	5
10	0	0	0	1	1	1	3
22	0	0	0	0	1	0	1

The next steps include the identification of mitigation strategies like notices, communications protocols, dispatch of emergency shuttles and potential deviations with special consideration to the vulnerable populations.

Environmental Profile

Transportation projects are commonly in close proximity to or cross environmentally sensitive areas. The Central Massachusetts region has a vast array of natural resources, and in juxtaposition, the needs of a growing population for more and better transportation infrastructure. In many ways, transportation infrastructure poses a big impact on the natural environment, particularly by causing changes in land cover, forest fragmentation, impacts to water quality (polluted runoff), high levels of noise, and increased air pollution, among others. The CMMPO recognizes that a regional ecosystem approach would help ensure that Commonwealth's major conservation goals and objectives are accomplished. The CMMPO will continue working with local agencies in an effort to improve current processes and keep promoting the region's conservation and preservation goals.

Environmental Consultation

FAST Act guidelines, as did MAP-21 before it, encourage early coordination with local communities to address environmental concerns and issues in the transportation planning process for the region. This early intervention can avoid conflicts and impacts of transportation projects in a cost effective and efficient manner. It also provides the opportunity for agencies to discuss potential environmental mitigation activities throughout the planning process, including avoidance or minimization of impacts. Generally, a discussion consists of potential environmental mitigation activities and potential areas to carry out these activities. These efforts could also have the greatest potential to restore and maintain the environmental functions affected by the long range transportation plan as well as projects programmed on the region's TIP.

Further, the MPO shall consult, as appropriate, with state and local agencies responsible for land use management, natural resources, environmental protection, conservation, and historic preservation concerning the development of the LRTP. The consultation shall involve, as appropriate:

- Comparison of transportation plans with State conservation plans or maps, if available; or
- Comparison of transportation plans to inventories of natural or historic resources, if available.

The environmental consultation process has played a vital role in the identification of the region's natural features. In addition, annual sessions have been an opportunity to strengthen the ties with local community organizations, state and federal agencies. The topics included in the annual Environmental consultation Session are included below in Table III-8.

Table III–8: Environmental Consultation Overview

2011	Introduction to the Environmental Consultation
2012	Presentation of the CMMPO Environmental Profile Maps
2013	MassDOT Impaired Waters Program
	The Nature Conservancy presentation about Stream Crossings and Water Ecosystems Overview, Challenges and Mitigation Techniques
	MAPC presentation about Watershed Planning Approach and Regional Stormwater Utility
2014	UMass Stream Continuity Assessments and Critical Linkages
	SnapTite Culvert Rehabilitation Systems
2015	Massachusetts Global Warming Solutions Act

	Massachusetts Clean Energy and Climate Plan for 2020
	Greenhouse Gas Meaurable Impacts and Health Effect
	Mobility2040
2016	Town of Spencer Culver Assessment
	MassDOT and MassWildlife Partnership presentation about wildlife crossings: Linking Landscapes.
	MassDOT presentation about the MaPPS application.
	MA Division of Fisheries and Wildlife presentation: Coldwater Fisheries: Protecting, Enhancing and Regulating a Critical Resource Area
2017	Mobility2040 Major Infrastructure Project: Route 9 West Brookfield Environmental Profile
	MassDOT presentation: Mitigation for US Route 20 Reconstruction, Charlton & Oxford
	Conservation Law Foundation presentation about the Global Warming Solutions Act
2018	Mobility2040 Major Infrastructure Project: I-495/I-90 Interchange Improvement Project
	CMMPO Performance-Based Planning & Programming and Stormwater Mitigation
	CMRPC Hazard Mitigation Planning for the Region
	Conservation Law Foundation presentation about the Fiscal and Economic Impacts of Autonomous Vehicles

CMMPO's 2019 Environmental Consultation

In 2019, the CMMPO focused the Environmental Consultation session on the environmental considerations of the Charlton-Oxford Reconstruction project on Route 20. This session was held in conjunction with the LRTP Public Outreach meeting in order to broaden the MPO's audience. Additionally, the CMMPO presented the *Transportation Planning Toolkit: Nature-Based Solutions for Stormwater Management* to the Statewide Stormwater Coalition soliciting feedback on the toolkit which then can be distributed to the region.

The compilation of "Environmental Profile Maps" on the regional level is simply an early indication of benefits and challenges associated with a particular transportation improvement project. Other established formal environmental processes through federal NEPA and state MEPA must often be followed. The maps provide more detail of the environmental features using a buffer zone within a half mile radius of a transportation project. This method allows the CMMPO to identify the areas susceptible to possible impacts and to assist in the evaluation of context sensitive solutions for planned projects. Since the CMMPO is not a permitting entity, it relies mostly on MassDOT and its programmatic units to enforce environmental compliance.

Nonetheless, the early identification of environmental and cultural features within the region has been proven beneficial in the overall project readiness for the TIP.

Regional efforts to compile Environmental Profile Maps for the areas in proximity to transportation improvement projects are based on MassGIS spatial data, which visually depicts key information used during the annual environmental consultation. The data layers from MassDEP, MassDCR and National Heritage & Endangered Species Program (NHESP) identify land set aside for conservation, recreation, water supply protection and wildlife habitat for endangered and protected species in the region; they also identify highly sensitive avoidance areas and those in need of conservation. Examples of these Profile Maps can be found in Figures III-7 through III-11.

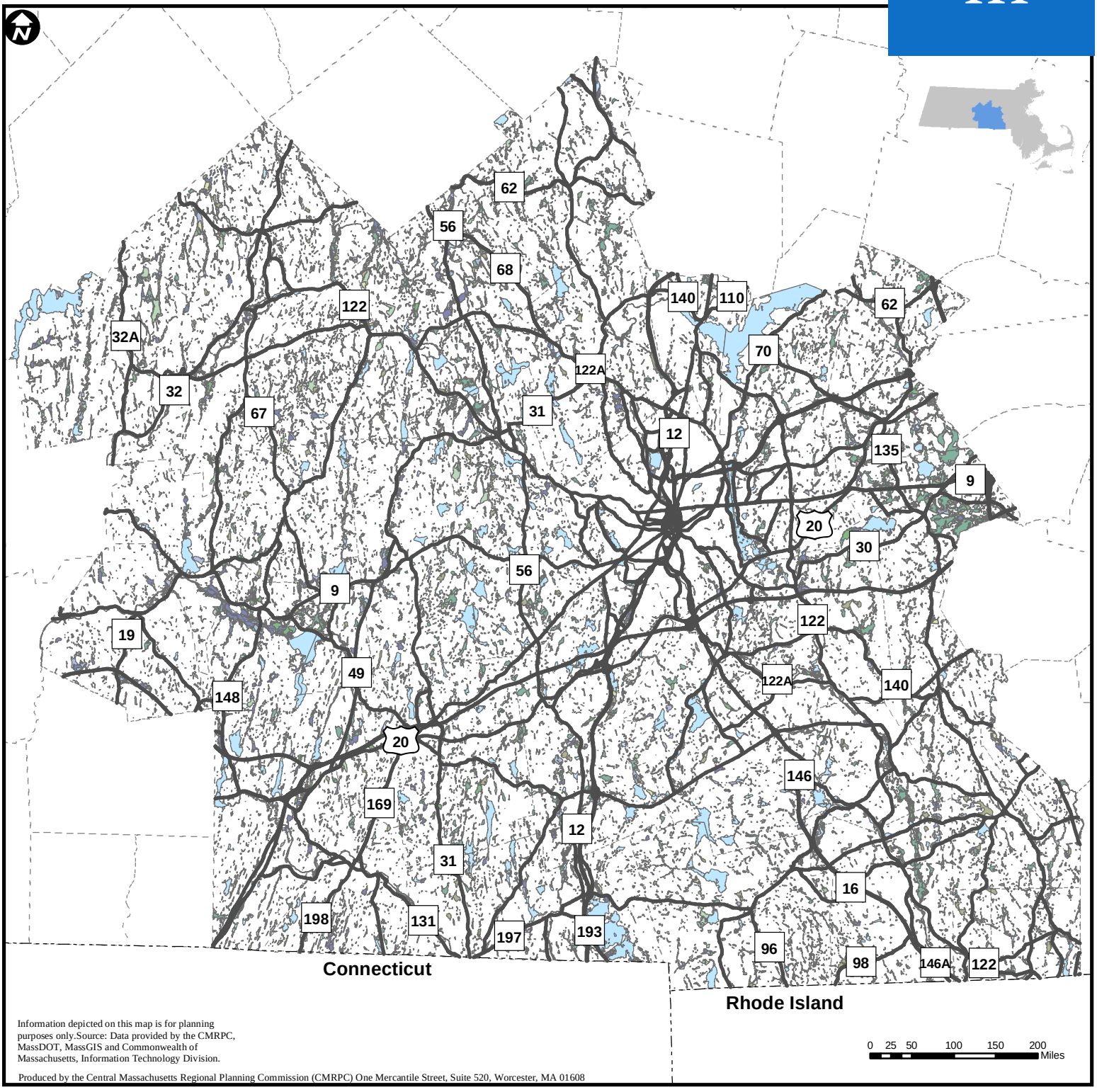


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Figure III-7 MassDEP Wetlands

TYPE

- BOG
- DEEP MARSH
- OPEN WATER
- SHALLOW MARSH MEADOW OR FEN
- SHRUB SWAMP
- WOODED SWAMP CONIFEROUS
- WOODED SWAMP DECIDUOUS
- WOODED SWAMP MIXED TREES

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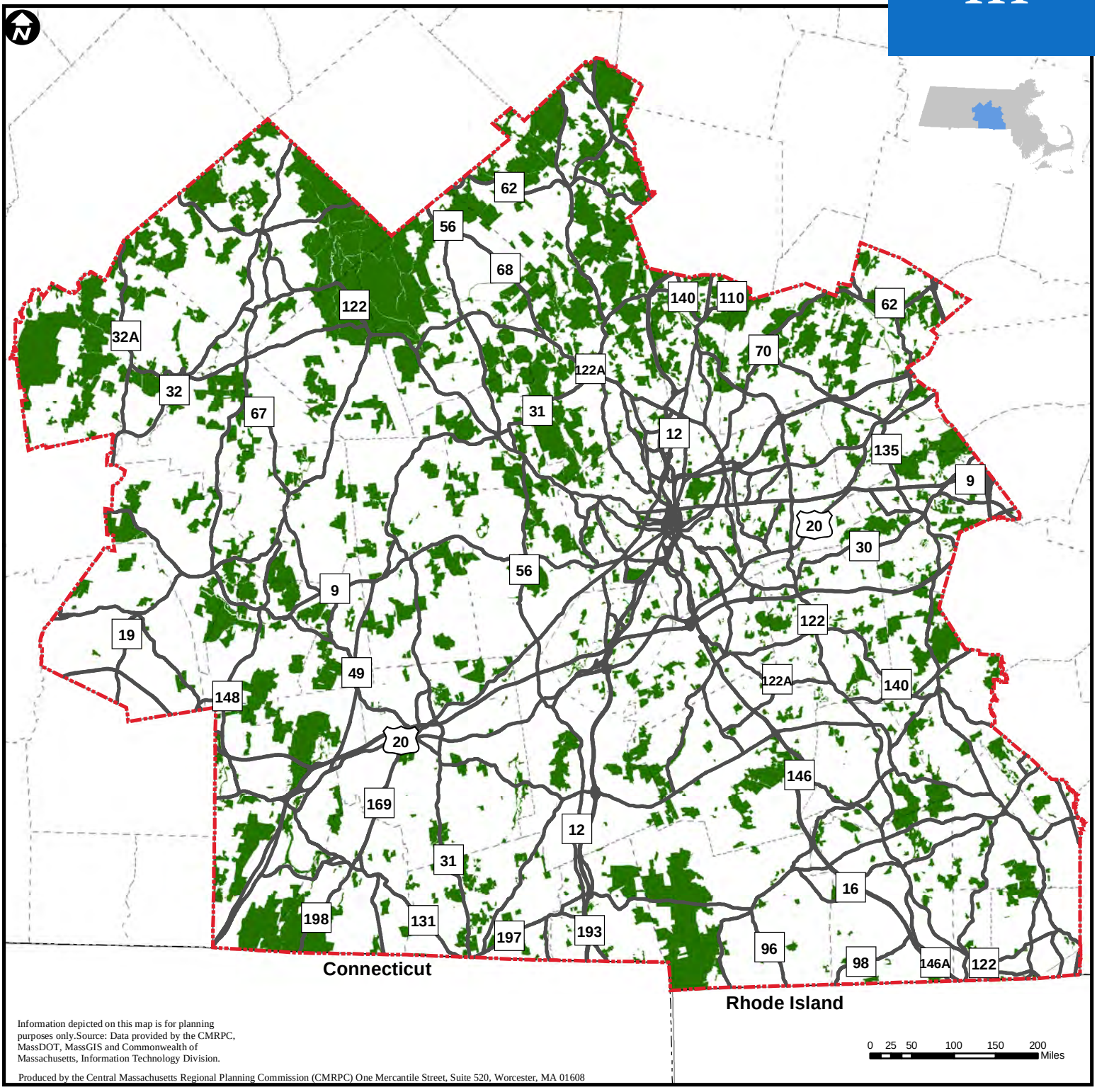

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Regional Planning Commission

Figure III-8 Open Space

- CMMPO Region
- CMRPC
- Open_Space_Protected_Land

Mobility2040
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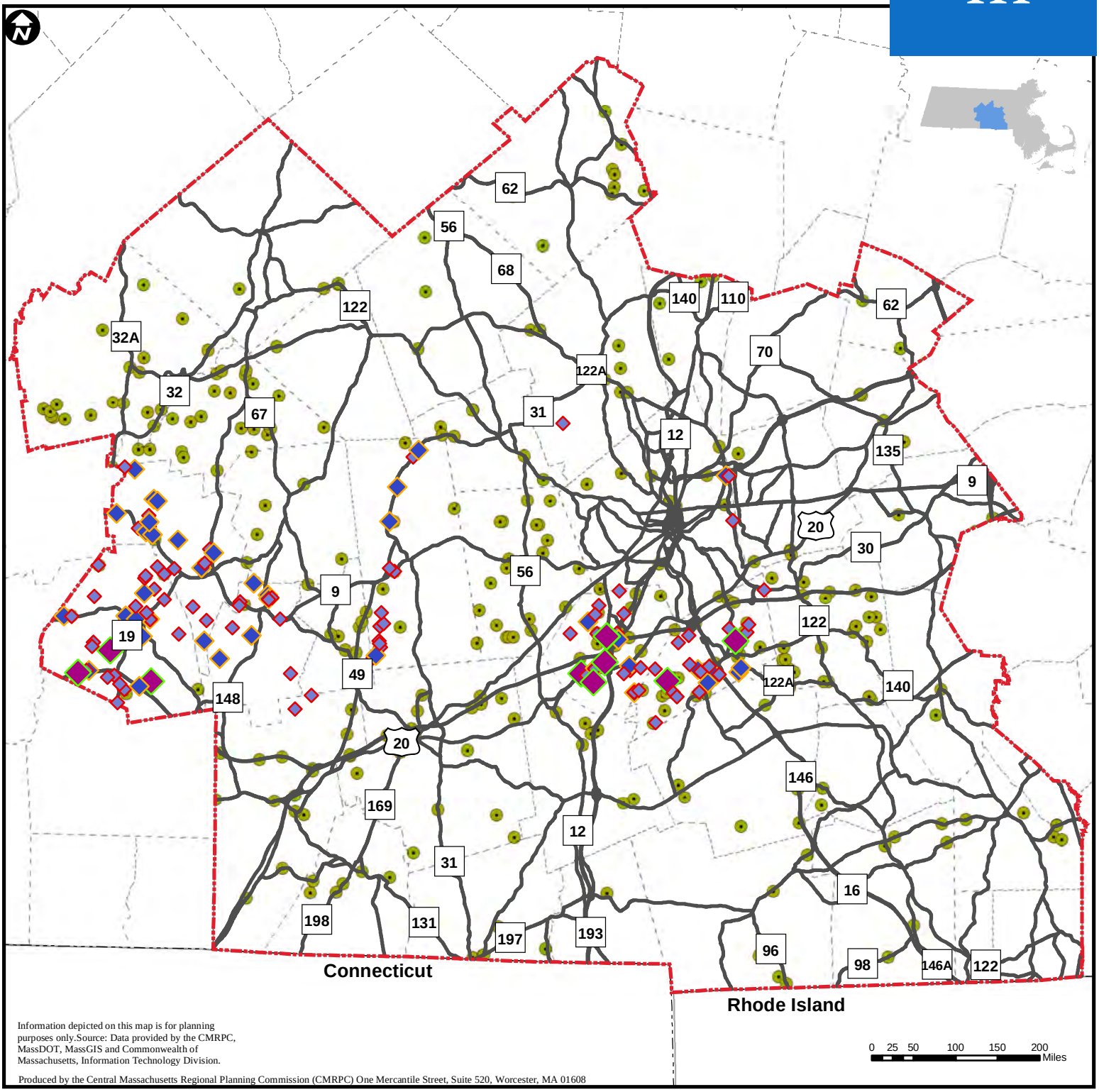
The Update for 2020



Information depicted on this map is for planning purposes only.Source: Data provided by the CMRPC, MassDOT, MassGIS and Commonwealth of Massachusetts, Information Technology Division.

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Figure III-9 Culvert Barrier Status

Legend

Culverts with Barriers

- Moderate barrier
- Significant barrier
- Severe barrier
- All Culverts CMRPC Region

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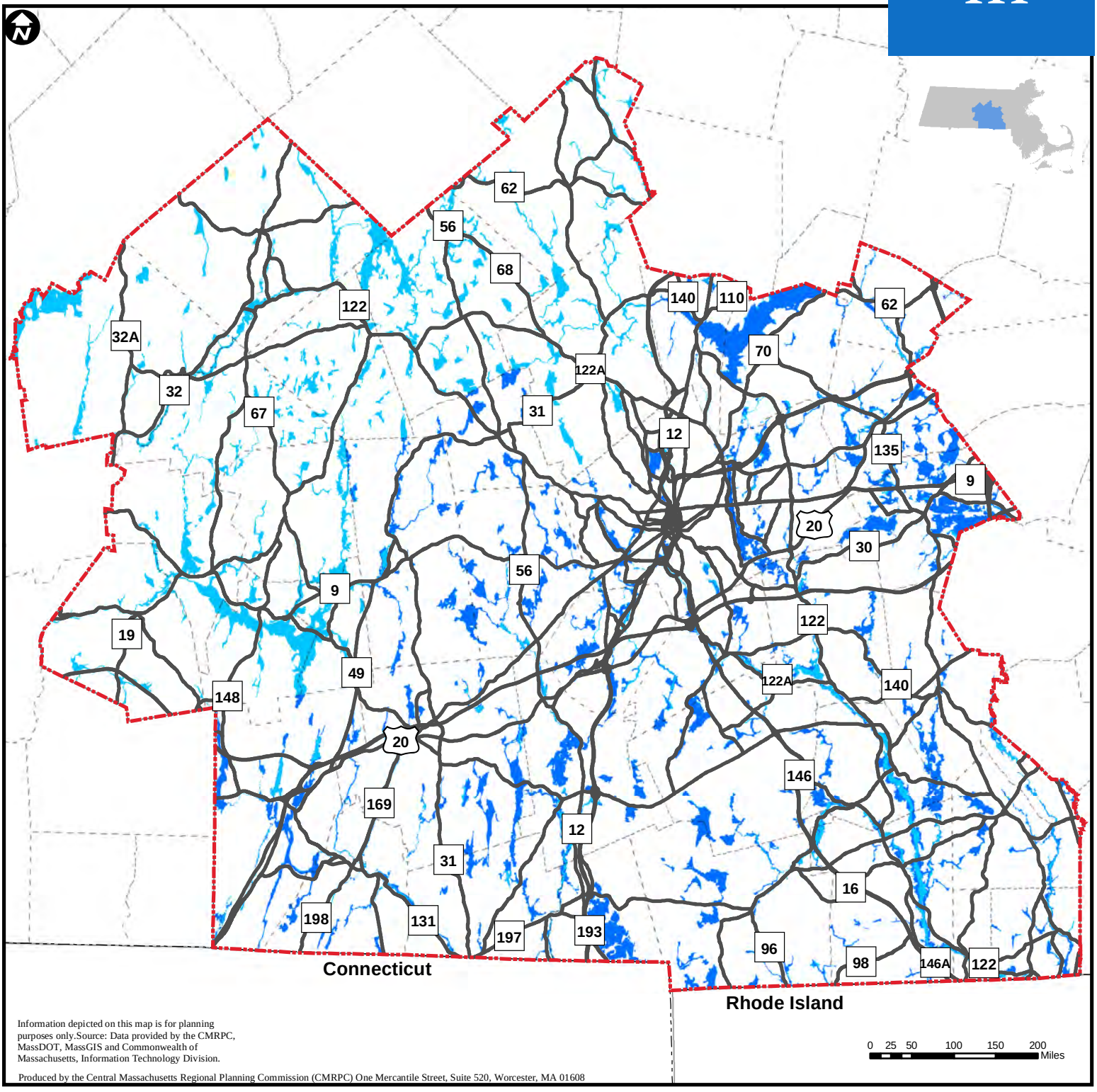

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Figure III-10 Flood Zones

Legend

Flood Zone Designations

- 100-year Flood Area (DFIRM)
- 100 Year Flood Zones (Pre-DFIRM)

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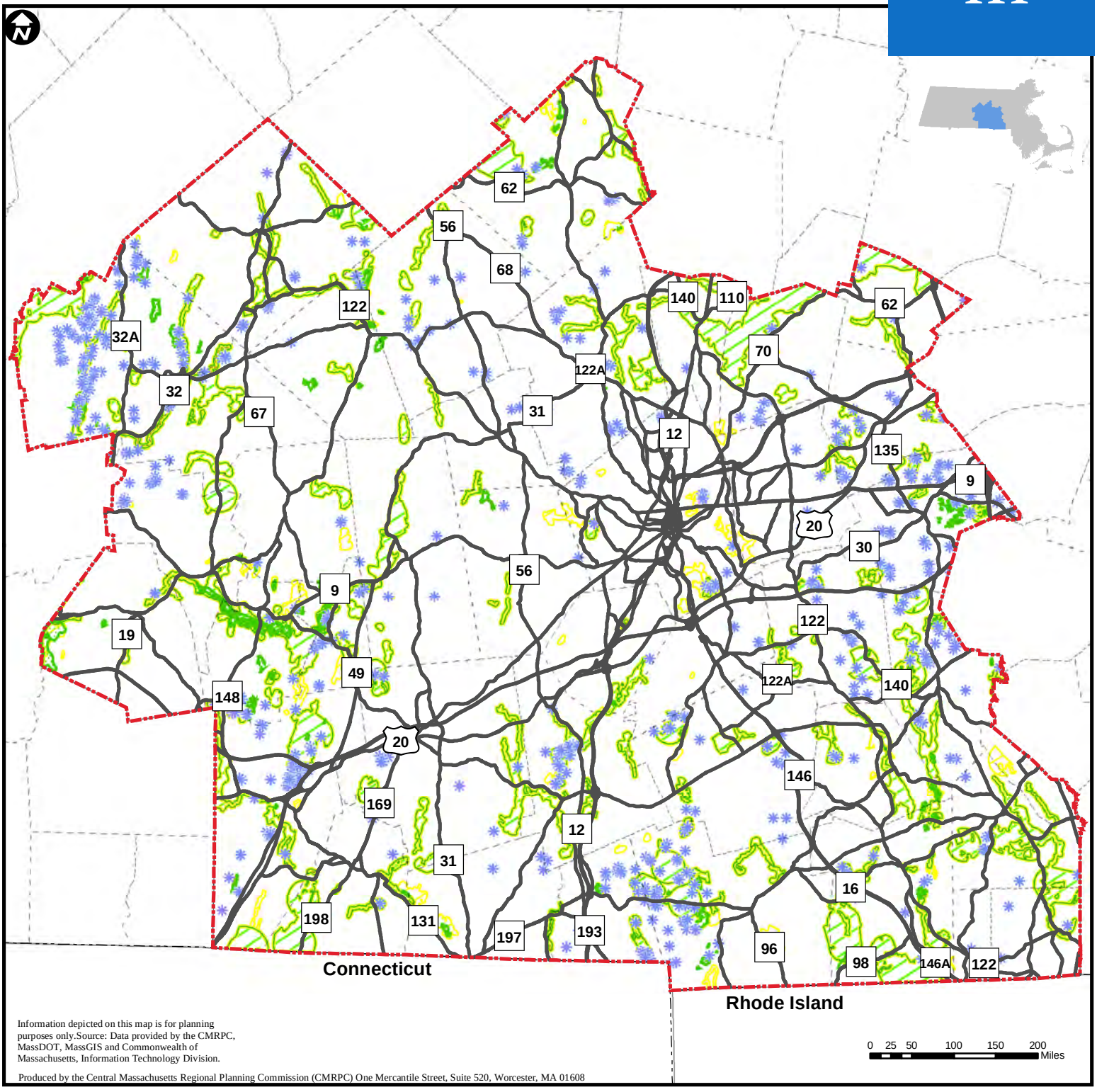

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Figure III-11 NHESP

Legend

- NHESP Certified Vernal Pools
- NHESP Natural Communities
- NHESP Estimated Habitats of Rare Wildlife
- NHESP Priority Habitats of Rare Species

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Brownfields

Central Massachusetts is one of America's oldest industrial regions. With abundant rivers and close proximity to the ports and investors in New England's coastal cities, Worcester and its environs provided the necessary conditions for early 19th century mills that required fast-moving water for machine power. More than 54% of workers in Worcester were employed in manufacturing by 1920. In the following decades, many manufacturing and commercial sites in the area's historic industrial neighborhoods and mill villages were abandoned or became underutilized. By 2014, manufacturing jobs had declined to only 13.2% of Worcester area employment, leaving a legacy of brownfield sites. These sites tend to be concentrated in areas with existing infrastructure along historic transportation corridors such as canals, rivers, railroads, and early (State) highways. Cleanup and redevelopment of these properties can foster transit-oriented infill development in Environmental Justice areas and can contribute to economic development generally.

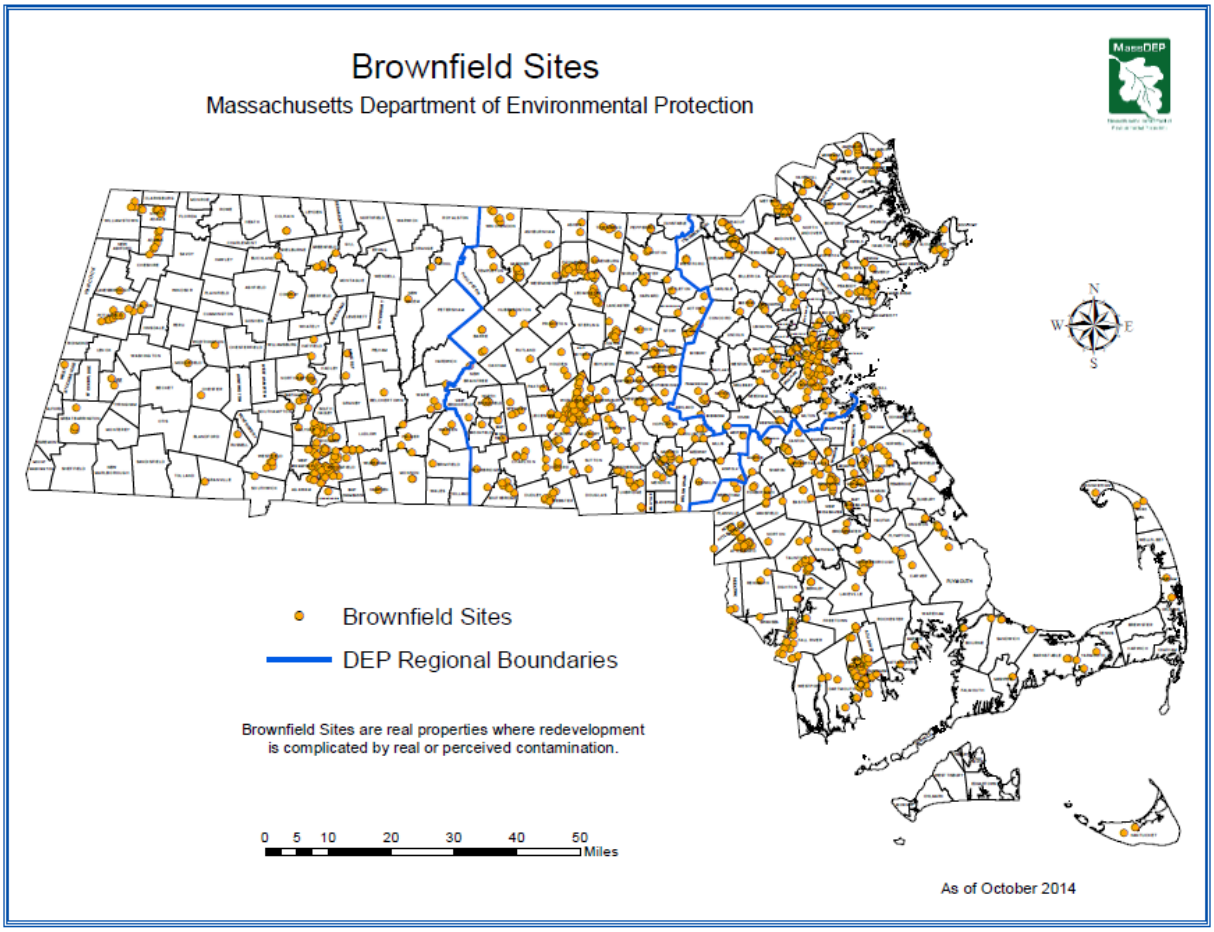
The US Environmental Protection Agency (EPA) defines a brownfield site as "real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant." Brownfields are therefore sites with known *or* perceived contamination. Contaminants or perceived contaminants include those in soil, groundwater, and indoor air, as well as hazardous building materials such as lead paint and asbestos. Figure III-12 shows the location of brownfield site across the state of Massachusetts. In 2014, the Massachusetts Department of Environmental Protection identified 240 brownfields in the CMMPO region that had been reported to its Chapter 21E cleanup program. This number is likely a substantial undercount since it does not include sites that have not been reported to MassDEP or those that are primarily impacted by hazardous building materials. While many brownfields in the area have been redeveloped and some others have been cleaned and are ready for redevelopment, others remain derelict, particularly in Worcester's industrial areas and in former mill villages furthest away from Boston's real estate boom.

CMRPC's Regional Brownfields Plan identified fifteen "areas of brownfields interest" (ABI) in the region based on a GIS analysis of historic land use patterns, environmental data, and socioeconomic data. These neighborhood-scale areas have the greatest vulnerability to (and impact from) brownfield sites still needing assessment and/or cleanup, and lack the resources to address them. The Plan also identified corridors as ABI due by the concentration of brownfield sites. CMRPC has prioritized use of its US EPA-funded brownfields site assessment program (started October 2018) in these areas. Other resources for brownfields planning,

assessment and cleanup are available from MassDevelopment, US EPA, MassDEP, and some municipalities.

Recent and ongoing major brownfield revitalization projects in the region include the new WRTA maintenance facility on Quinsigamond Ave. in Worcester, the South Worcester Industrial Park on Armory St., the Holden Public Works facility on Industrial Ave., and the former Worcester County Courthouse on Highland St.

Figure III-12: MassDEP Brownfield Sites



Source: http://www.mass.gov/eea/docs/dep/cleanup/bfmap1014.pdf

Shown in Figure III-13, the 15 Areas of Brownfield Interest in the region are:

1) Auburn: Southbridge Street Corridor ABI
2) Barre: South Barre ABI
3) Dudley & Webster: Main Street Corridor ABI
4) Hardwick: Gilbertville ABI
5) Holden: Main Street Corridor ABI

6) Hopedale: Draper Mill & Vicinity ABI

7) Southbridge: Commercial District ABI

8) Spencer: Downtown ABI

9) Sturbridge: Route 20 Corridor ABI

10) Uxbridge: Mill Villages ABI

11) Worcester, District 1: Greendale ABI

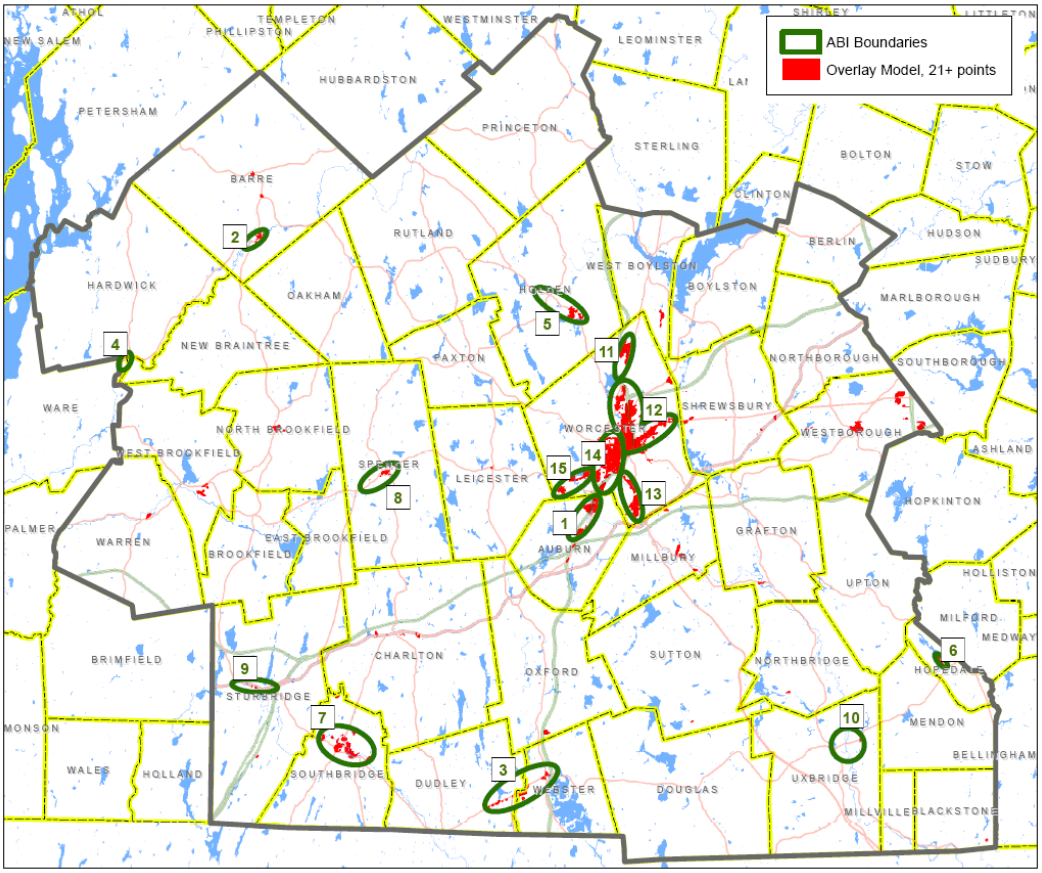
12) Worcester, District 2: Downtown/East Side ABI

13) Worcester, District 3: Quinsigamond Village & Lower Vernon Hill ABI

14) Worcester, District 4 Main Middle, Main South & South Worcester ABI

15) Worcester, District 5: Park Avenue & Webster Square ABI

Figure III-13: Areas of Brownfields Interest, Regional Brownfields Plan



Source: www.cmrpc.org/regional-brownfields-plan

Emerging Technologies

The CMMPO, along with other MPOs, state and federal transportation officials, are well aware of 'disruptive technologies' and their potential effect upon mobility. The transportation sector's expectations for rapid deployment of new transportation technologies have been tempered by the pace of technology development itself, and by market and regulatory impediments. Indeed, in response to inventors and investors seeking to obtain necessary USDOT safety authorizations, permits, and funding, U.S. Secretary of Transportation Chao announced on March 12, 2019 the creation of a USDOT Non-Traditional and Emerging Transportation Technology (NETT) Council. This Council's task is to identify and resolve jurisdictional and regulatory issues among USDOT's eleven operating administrations. The Council will also serve as a single USDOT access point to project sponsors wishing to discuss or propose specific transportation projects.

What do some transportation professionals predict? Cubic (a Transportation Networking Company tech vendor) opined in 2018 that "future cities will aggregate density of directional travel, keep a healthy balance of shared vehicles on roads, as well as encourage more active forms of transportation, such as walking and cycling, and in that way lessen the overall impact of transportation on the environment. To achieve these goals, Cubic suggested that the transportation industry would likely shift some of its current monitoring activities toward a high level of active transportation management. Its predictions are: "In suburban and regional areas we will still see the use of cars, both owned and shared, but these vehicles will progressively change shape, form and function as they become less driver operated; they will be used to take individuals or small groups from their homes to the transit corridor (or vice versa), where they can transfer onto higher density services."[19]

Focus Area 1: Communications

The Institute of Transportation Engineers (ITE) suggests that as Connected and Autonomous Vehicles (CAVs) will need to connect and communicate with other vehicles, traffic signals, 'smart city' infrastructure and other devices essential for transportation automation. ITE foresees that a robust broadband network will be essential. Technologies associated with vehicle communication pathways are described as Vehicle to Vehicle (V2V); Vehicle to Infrastructure (V2I), and Vehicle to Everything (V2X). Dedicated short-range communications (DSRC) is a Federal Communications Commission (FCC) wireless communication protocol that

[19] Cubic https://www.cubic.com/sites/default/files/Maas_Final_Whitepaper.pdf

has been established for ITS – targeted to traffic operational improvements and crash reduction utilizing On-Board Units (OBU) and Roadside Units (RSUs) that can communicate information about infrastructure and conditions. ITE reports that technologies capable of communicating on DSRC networks may be embedded in certain vehicle manufacturers' products as early as 2020.[20] The practical effect of these communication developments is that the CMMPO will be funding both highway and transit projects that include equipment necessary for active traffic management - particularly for roadways and for transit vehicles.

Focus Area 2: Mobility as a Service (MaaS)

There are more mobility options available today than in the past. Mobility as a Service (MaaS) is an example; it is constructed upon the integration of multi-modal transportation options in a single platform. This approach to transportation is said to be attractive to Millennials, who as a group are adopting technology changes faster than older populations. Industry advocates predict that by 2040 most of the population will have some type of experience with these mobility platforms - primarily persons who live in urban areas. However, MaaS appears to hold promise for providing new or expanded transportation options in rural areas - and in meeting the unmet transportation needs of vulnerable populations.

Governor Baker's Commission on the Future of Transportation recommended that transportation officials should accelerate efforts to develop policies that support these mobility changes, including policies related to ride-sharing, vehicle-sharing, micro-mobility. and on-demand mobility.

The MaaS concept is built upon the following assumptions:

- transit systems will no longer be built and operated upon specific modes, i.e. buses, ferry, rail;
- consumers would subscribe with a mobility provider and maintain a mobility account, payable monthly, for mobility services;
- consumers would not own or lease vehicles or other mobility devices, and
- consumers would be required to use IT technologies to access service.

Industry technology vendors suggest that MaaS implementation will lead toward a public mobility scenario in which principal transportation corridors are dominated by large transit vehicles such as commuter rail or Bus Rapid Transit, while mobility in urban areas is supplied by

[20] ITE Journal, "Connected and Autonomous Vehicles", March 2019, p. 32.

the subway system or light rail and buses – whether autonomous or not – and in the case of buses, these vehicles would be deployed in fixed-route or on-demand service.[21]

Current transportation innovations supporting MaaS include:

- Microtransit services in unserved or hard-to-serve regional subareas
- New partnerships with employers and institutions – particularly medical care providers relocating and/or opening new facilities in 'suburban' settings, i.e. malls
- Means-tested transit fares and fare-free transit
- Crowd-Sourced Intercity Bus Services, i.e. Wanderu (discussed in Intercity Bus section) and Flixbus
- On-Demand Paratransit: The MBTA/Uber/Lyft/Curb Pilot Project is the first Massachusetts example; the Greater Attleborough-Taunton Regional Transit Authority (GATRA) has also implemented an on-demand paratransit pilot service.

Focus Area 3: Freight Logistics

Automated freight delivery. As shown in Figure III-14, Amazon's Scout is a six-wheeled device that as of February 2019 is being tested in Snohomish County, WA. Meanwhile, FedEx is experimenting with its SameDay Bot (Figure III-15), a robotic device is designed to travel on sidewalks, to handle hot and cold packages, and can scale stairs and other transitional surfaces to deliver to individual customers. Starship Technologies, another vendor, began operating a pilot project in California utilizing its device as shown in Figure III-16.

Figure III-14: Amazon's Scout

[21] https://www.cubic.com/sites/default/files/Maas_Final_Whitepaper.pdf

Figure III-15: FedEd SameDay Delivery Bot

Figure III-16: Starship Technologies Automated Delivery Bot

Starship's website is targeted to potential businesses that might become its customers. Its technology is intended to deliver parcels, groceries and food directly from stores when initiated by a customer using a mobile application that allows both Starship and the customer to monitor the delivery's progress.

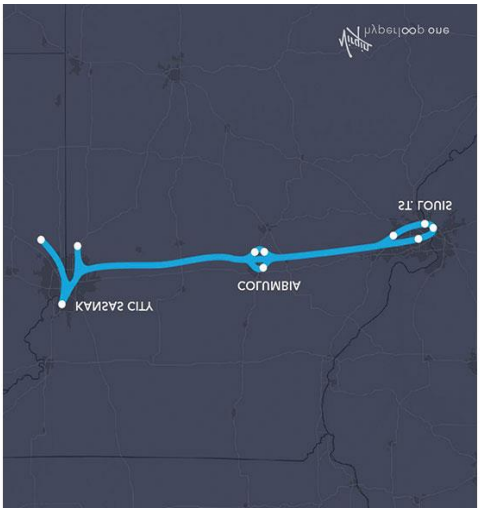
Focus Area 4: Multimodal Corridors

The transportation sector's expectations for rapid deployment of new transportation technologies in corridors which could transport both passengers and freight is evolving significantly. USDOT is advising that one or more project sponsors are seeking various approvals in several states for such projects, as shown in Figure III-17 and Figure III-18 below:

- Missouri has proposed the I-70 route to Hyperloop One as part of the Missouri Department of Transportation's "Road to Tomorrow" project to promote innovation along I-70. Connecting Kansas City, Columbia, and St. Louis.

Figure III-17: Virgin's Hyperloop One Prototype Test Vehicle

Figure III-18: Virgin's Proposed I-70 Hyperloop Route



- Pennsylvania Turnpike Commission is conducting a feasibility study for a project that could transport people between Philadelphia and Pittsburgh in under 30 minutes.

As of the writing of this Plan, Hyperloop technology is envisioned as a tubular track through which a train-like pod carries passengers at speeds up to 640 mph. Some estimates have put the cost at $25 million to $27 million per mile, excluding land acquisition.[22]

Implications for CMMPO Planning Activities

[22] https://www.nytimes.com/2019/02/18/technology/hyperloop-virgin-vacuum-tubes.html

What does this mean for MPO planning activities generally, technology development/implementation, and in particular for CMRPC's staff in implementing Mobility2040? While much of the long-term effects of these and other 'disruptive technologies' is as yet uncertain, it is important to 'open the door' and recognize them – as other MPOs are now doing. Here are a few CMMPO activities associated with Emerging Technologies:

- Legislative advocacy (through MARPA) for: 1) state enabling local option taxes, and 2) rideshare regulation modifications. If enacted into law, regions of the Commonwealth would be able to generate new revenue supporting region-specific transportation investments.
- Advancement of Complete Streets Program in the region's municipalities: staff assists cities and towns in securing Complete Streets designations from MassDOT and in preparing required policies and plans for local adoption.
- Commuter Rail: MBTA Framingham-Worcester Line – increased service frequencies; station and platform upgrades; Positive Train Control; participation in MassDOT East-West Rail Study and MBTA Rail Vision Plan;
- Pavement Management: aggressive field assessments, Plan development
- Freight: investments in Green Technologies (G&U Railroad); CSX Intermodal Terminal
- As shown in Figure III-19, Shared Mobility Devices: staff support to the City of Worcester for dockless bikeshare (Ofo, 2018) and subsequent proposals, i.e. LimeBike (2019 unknown?) E-scooters?

Figure III-19: Lime E-Bikes

- Electric charging stations (see Figure III-20): MassDOT is participating in a multi-state initiative to develop these facilities, in order to meet GHG goals. Meanwhile, private-

sector organizations such as Mogile Technologies (a TNC) in 2012 developed ChargeHub https://chargehub.com/en/ to help people choose an electric vehicle, set up charging at home, and find charging stations on the go. Mogile also promotes electric vehicle technologies in Canada and the U.S.

Figure III-20: MassDOT Electric Vehicle Charging Station

- Transit Planning: CMRPC Transit staff conducts WRTA service planning, which ensures maximum coordination between the WRTA and the CMMPO on policies, programs, and project/study funding. Incremental transit facility and service improvements:

  Extensive IT Systems Suite (implemented in 2012; modifications and adaptations ongoing)
  New Hub (2013) and Maintenance/Operations Facility (2016)
  Online paratransit fare management option (new, 2019)
  Next-day paratransit reservations capability (new, 2019)
  Electric Bus Pilot Project (2013-present)
  Fleet 'right-sizing' – future vehicle procurements
  Solar tech deployments: WRTA Hub (2013) and Maintenance & Operations Facility (proposed)
  New fare collection system (concept in development)

- Transit improvements in development:

  Mobile Ticketing/Fare Collection System Upgrades
  New cross-border transit service connections

CHAPTER IV

Transportation Modes

Introduction

The CMMPO region's transportation system is a multimodal network of roads, bridges, transit routes, parking and freight facilities, and bicyclist and pedestrian infrastructure. It is also comprised of vehicles, mobility devices, and IT hardware/software that are often considered ancillary in terms of capital costs but nonetheless are critical transportation system components. This integrated system serves the region's forty communities and connects them with one another and to neighboring regions and beyond.

The region's transportation system is principally owned and maintained by:

- The US Army Corps of Engineers (USACOE);
- Massachusetts Department of Transportation (MassDOT);
- Massachusetts Port Authority (Massport);
- Massachusetts Bay Transportation Authority (MBTA);
- Massachusetts Department of Conservation & Recreation (DCR);
- Worcester Regional Transit Authority (WRTA);
- private intercity bus, passenger and freight (rail and truck) operators, and
- The CMMPO region's forty municipalities.

In addition, private for-profit and non-profit agencies have long provided both public and private transportation in the region. They utilize publicly funded infrastructure; some utilize vehicles and/or deliver publicly funded services. Now, rideshare and shared mobility providers are fast becoming an integral part of the region's transportation system. Their fit with traditional transportation planning is evolving; they depend upon the use of vehicles, facilities and rights-of-way they do not necessarily own, control, or have specific rights to use. The CMMPO's challenge (along with the entire industry) is to collectively define the public's role in planning, regulating and funding such services.

Mobility2040's purpose is to create the framework for continued intraparty coordination in the development of an accessible, seamless intermodal transportation network. This network is essential for public access to civic activities, education, employment, government services, health care, and recreation.

The region's transportation planning process continues to be shaped by key Commonwealth policies cited in prior CMMPO plans, including:

- Massachusetts Healthy Transportation Compact ('Compact', 2009): a partnership of several state agencies to direct transportation decision-making so all network users

would have expanded mobility, access to essential services, a cleaner environment, and improved public health. MassDOT formalized its commitment to the Compact in its Healthy Transportation Policy Directive (2013). This Directive was developed consistent with USDOT's *Accommodating Bicycle and Pedestrian Travel: A Recommended Approach* - a policy recommending expansion of bicyclist and pedestrian accommodations. While the Compact is no longer formally active, many of the innovations it initiated remain current.

- Commonwealth's Global Warming Solutions Act (2008) set the legally-enforceable goals of reducing GHS emissions by 25 percent below 1990 levels by 2020, and 80 percent below 1990 levels by 2050. In August 2017, the Department of Environmental Protection updated 310 CMR 60.05: Global Warming Solutions Act requirements for Transportation. This regulation places obligations on MassDOT and Metropolitan Planning Organizations to consider GHG emissions in transportation planning.
- The Transportation and Climate Initiative (TCI) is a regional collaboration of 12 Northeast and Mid-Atlantic States (including Massachusetts) and the District of Columbia that seeks to improve transportation, develop the clean energy economy and reduce carbon emissions from the transportation sector.

The advent of Transportation Networking Companies (TNCs), along with automated and connected vehicle technologies, requires the CMMPO to reevaluate some of its traditional program and project priorities. While so-called 'disruptive technologies' are evolving rapidly, the CMMPO has attempted to capture the essence of these developments in this 2019 Update.

In addition, the CMMPO and its peers continue to advance transportation performance management activities. The practice is evolving; for example, performance is not only being measured on a mode-by-mode basis. The staff has prepared this update with consideration of new technical resources, such as FHWA's February 2018 Guidebook for Measuring Multimodal Network Connectivity. The CMMPO intends to use resources such as this Guidebook to ensure that it prioritizes projects that 'get the most out' of existing transportation investments – multimodal connections are a key to realizing this goal.

The following sections contain:

- a brief overview of each mode and associated CMMPO performance management goals;
- a facility and/or service gap analysis and a needs assessment (including an analysis of how well a specific mode provides access to essential services) was completed, and
- a prioritization strategy to address unmet needs.

Bicycle and Pedestrian

Background

Bicycle

The CMMPO staff has been charged with creating a comprehensive, multi-modal strategy that includes bicycling as an integral part of the region's transportation system. In order to balance the needs of all system users, multimodal transportation options will become essential in the future. Municipalities across the Commonwealth are working hard to keep up with demands on the existing transportation network. Through this struggle, it has become apparent that cities and towns that seek a positive health outcome in the future will need to balance various modes of transport through an integrated, multimodal network.

The most recent CMMPO Regional Bicycle Plan, completed in 2018, is intended to identify opportunities for encouraging and enhancing bicycle travel within the CMMPO region. In order to allow for a more thorough analysis, the two components of the former CMMPO Regional Bicycle and Pedestrian Plan were split into two separate documents to reflect MassDOT's current efforts with the Statewide Bicycle Plan and the Statewide Pedestrian Plan. The 2018 CMMPO Regional Bicycle Plan has seven major associated tasks: Existing Conditions/Data Collection, Analysis of Existing Conditions, Strategies/Facility Recommendations, Implementation/Benchmarking, Documentation, CMMPO Bicycle & Pedestrian Advisory Committee, and Public Participation/Outreach. The intent of the 2018 CMMPO Regional Bicycle Plan is not to secure funding for every project, but to identify potential opportunities. The recommendations contained in the plan are intended to be used as a guide for local jurisdictions in taking advantage of these opportunities. Data from the U.S. Census Bureau shows that, in the time period from 2012-2016, less than 1.2% percent of work commute trips in the CMMPO region were made via bicycle. On the other hand, 80.74% percent of work commute trips in the region were made via single occupant vehicles (SOVs). Providing well-designed bicycle networks is a key component to the overall transportation vision for the region. Implementation of the recommendations of this plan will provide for a comprehensive bicycle transportation network that is focused on accessibility, mobility, and safety.

2018 Statewide Bicycle Transportation Plan

This plan lays out an action-oriented strategy built around three key principles. The first is to reverse the decades-long practice of prioritizing automobile travel over all other modes by

granting people biking opportunities as the same level of importance as drivers in regards to planning, design and maintenance processes. The second is to fix the types of physical gaps and barriers in the transportation system that discourage everyday biking, such uncomfortable roadway crossings, poorly maintained roads, and lack of bike parking. The third principle is for MassDOT to lead by example to both inspire and collaborate with municipalities to advance safe, comfortable, everyday biking.

The vision of this plan is to provide a safe, comfortable, and well connected bicycle network that will increase access for both transportation and recreational purposes. The Bike Plan will advance bicycling statewide for everyday travel, particularly for short trips of three miles or less, to the broadest base of users and free of geographic inequities.

Pedestrian

The CMMPO staff has been charged with creating a comprehensive, multi-modal strategy that includes pedestrian travel as an integral part of the region's transportation system. Planning for pedestrians has become more of a planning trend as almost every single trip— whether it be by car, bike, bus, or train – does involve some walking. The CMMPO vision strives to take advantage of walking benefits to the region: improved health outcomes, air quality and environmental impact, transportation efficiency, safety, economic development and activity, attraction and retention of employers and employees, social engagement, and overall improved quality of life at a neighborhood and regional level. In cities and towns across the nation, walkability has become a key factor for measuring a community's quality of life. Improved availability of efficient and safe pedestrian networks has played a strong role in making a city or region more competitive economically, attractive to a talented workforce, and sparked interest in public and private investment.

The most recent CMMPO Regional Pedestrian Plan, completed in 2018, is intended to identify opportunities for encouraging and enhancing pedestrian travel within the CMMPO region. The Regional Pedestrian Plan is intended to facilitate the expansion and upgrade of the pedestrian network in the region in order to encourage more walking trips and safely link important destinations to where people live. The Pedestrian Plan also aims to support the work of the Central Massachusetts Regional Public Health Alliance's (CMRPHA) Community Health Improvement Program (CHIP) as it relates to walking. In doing so, this Plan documents the extensive pedestrian-related planning and project development work being conducted in the CMMPO Region, including ongoing Complete Streets work. Similar to the CMMPO Regional Bicycle Plan, the purpose of the Regional Pedestrian Plan is not to secure funding for every

project, but to identify potential opportunities. The pedestrian-related recommendations should be used as a guide for local jurisdictions in taking advantage of these opportunities as well as a guide for CMMPO pedestrian policy and project performance monitoring/evaluation. Implementation of the recommendations of this Plan will provide for a comprehensive pedestrian transportation network that is focused on accessibility, mobility, and safety.

2018 Statewide Pedestrian Transportation Plan

This plan defines a vision for Massachusetts in which all people have a safe and comfortable walking option for short trips. When pedestrian facilities, including sidewalks, ramps, and crosswalks, are absent, poorly maintained, or unsafe, it puts people in danger, encouraging trips in cars that could reasonably be made on foot. MassDOT's focus on walkability will help reduce the demand for new vehicle trips, reduce greenhouse gas emissions, promote public health, and support economic development. Walkability also encourages and supports other sustainable travel modes like transit and bicycling. This plan outlines how MassDOT will support its municipal partners in their efforts to improve walkability. Additionally, the plan establishes a comprehensive approach for MassDOT to lead by example to better operate and maintain the walking infrastructure under its jurisdiction and to make investments in new facilities.

Performance Management

As discussed in Chapter II of this report, federal laws require performance based planning related to federal emphasis areas. Federal rules of PM1 (Safety) and PM2 (State of Good Repair incorporates bicycle and pedestrian related goals. Additionally, there are two regionally customized goals under the multimodal emphasis area. These goals are:

Goal 1 – Reduce number and rate of fatal and serious injury crashes in the region. Move towards zero deaths (PM1).

- A rolling average of 32.1 combined non-motorized fatalities and serious injuries in the CMMPO region.

Goal 2 – Improve transportation accessibility for all modes by improving roadway infrastructure.

- Reduce mileage of sidewalks in poor condition by 10% over 10 years.
- Increase the number of ADA compliant ramps in the region by 100 per year for a total of 2,975 compliant ramps in 10 years.

Goal 3 – Expand the bicycle, pedestrian, and transit network in the region.

- Add 200 new miles of bicycle and pedestrian facilities by 2040.

Goal 4 – Implement Complete Streets policies for host communities.

- Increase the number of communities with Complete Street policies by 10% every 10 years.

Analysis

During the development of the Regional Bicycle and Pedestrian Plans, the data collection phase involved the accumulation of Geographic Information System (GIS) data from CMRPC, MassDOT, and municipalities throughout the region. The cataloging of existing conditions allowed MPO staff, along with regional stakeholders and citizens, to develop a baseline for developing and prioritizing new projects. The analysis of existing conditions included looking at all existing bicycle and pedestrian facilities, projects that are programmed for construction in the near future, origins and destinations that are or could be popular for people who bike and walk, and existing opportunities and constraints that could play a role in how bicycling and pedestrian infrastructure is developed in the future. A thorough analysis of existing conditions in the Central Massachusetts Metropolitan Planning Organization region was necessary before providing recommendations for new facilities, programs, and policies.

Regional Bicycle and Pedestrian Count Program

CMMPO staff conducted a pilot bicyclist and pedestrian counting program in support of its 2011 Regional Bicyclist and Pedestrian Plan. The staff monitored bicycling and walking trips on the region's existing trail network. Staff expanded the program in 2012 and 2013 to include specific City of Worcester roadways with marked on-road bicycle lanes. These roadways were sampled to evaluate overall usage and specific commuting patterns from various Worcester-based trip origins. The program was again expanded in 2014 to conduct counts at community-requested locations. Staff selected locations that would allow the host community to make full use of the data; to assist a project design with bicycle and pedestrian elements, to complement communities' future plans for enhancements such as adding a sidewalk, crosswalks, bicycle lanes, or for general knowledge. Since 2016/2017, much of what work being conducted as part of this program has migrated into the Complete Streets and Turning Movement Count (TMC) Programs.

MassDOT Complete Streets Funding Program

The MassDOT Complete Streets Funding Program has helped CMMPO staff to work with communities across the CMMPO region to make great strides in adopting policies and developing Prioritization Plans, which have led to a number of communities receiving funding to construct their first Complete Streets project. The CMMPO staff has assisted 21 of the 40 communities with Complete Street policies, with 11 of those 21 having approved Prioritization Plans and 5 of the 11 with Tier III construction grants. The MassDOT Complete Streets Funding Program, created by legislative authorization in the 2017 Transportation Bond Bill, provides technical assistance and construction funding to eligible municipalities. Eligible municipalities must pass a Complete Streets Policy and develop a Prioritization Plan. The program is structured into three tiers that assist communities wherever they are in the process:

- Tier I – Complete Streets Training & Policy Development
- Tier II – Complete Streets Prioritization Plan Development
- Tier III – Project Construction Funding

Examples of bicycle facility projects within the Complete Streets Program include:

- Improvement of shared use paths
- Designated bicycle lanes
- Bicycle parking fixtures and/or shelters at transit and other locations
- Bicycle wayfinding signs
- Shared lane markings (sharrows)
- Bike route signs
- New shared use paths
- Intersection treatments (bicycle signals, bicycle detection, bike lane extensions, turn boxes)

Examples of pedestrian facility projects within the Complete Streets Program include:

- Sidewalk repairs
- Providing ADA/AAB compliant curb ramps
- Detectable warning surfaces
- Pedestrian wayfinding signs
- Providing new sidewalks
- Providing pedestrian buffer zones
- Pedestrian refuge islands
- Curb extensions

- Crosswalks
- Accessible pedestrian signals
- New pedestrian accommodations at existing traffic signals

Bicycle and Pedestrian Plans Survey and Meetings

A survey was developed in an effort to provide additional input and feedback about the regional needs regarding bicycling and walking. The intention behind the survey was to collect a voluntary response from across the region, with the knowledge that the typical responder would already have an interest in bicycling or walking. The survey was administered mainly online, but hard paper copies were also made available. Walk Bike Worcester, a local multimodal transportation advocacy group, was an integral partner in the dissemination of the survey and key stakeholder in the public outreach process. CMMPO staff utilized Facebook, Twitter, and other media outlets to promote the development of the plan and provide links to surveys, information, and public meeting notices.

Sub-regional meetings with planning, public works, or engineering staff of the various CMMPO communities were held to gain further input on local efforts and to provide a regional consistency to the plans. Each sub-regional meeting was presented with data and maps from stakeholder input sessions and asked to clarify or revise as necessary related to local needs and priorities. This approach was taken in order to try and receive the most amount of feedback from the 40 municipalities in the CMMPO region, allowing for citizen comment and a feedback loop with government officials.

Bicycle Parking Program

The Central Massachusetts Metropolitan Planning Organization (CMMPO) committed $100,000 in Transportation Alternatives Program (TAP) funding for installation of bicycle parking racks in FY 2015 of the 2015-2018 Transportation Improvement Program (TIP). This program allowed municipalities to expand bicycle parking at a reduced cost. About half of the CMMPO communities participated in this program and purchased one or more bicycle racks to install in a designated area within their community.

Safety

The Massachusetts Department of Transportation generates a listing of Highway Safety Improvement Program (HSIP) eligible Auto, Bike, and Pedestrian clusters for the Commonwealth. A list of HSIP eligible locations for the CMRPC planning region was derived

from the statewide list. Seven bicycle crash clusters and ten pedestrian crash clusters have been identified as HSIP eligible for the region. Communities that wish to pursue HSIP funding for a project to improve safety at any of these locations will need to perform a Road Safety Audit (RSA). The Federal Highway Administration defines a Road Safety Audit (RSA) as the formal examination of an existing or future road or intersection by an independent, multidisciplinary team. The purpose of an RSA is to identify potential safety issues and possible opportunities for safety improvements considering all roadway users. Communities can contact CMMPO staff for further assistance regarding this requirement.

Other Efforts

- City of Worcester: Staff collaborates extensively with Worcester through involvement with Walk Bike Worcester and the Worcester Transportation Advisory Group (TAG) to promote bicycle and pedestrian projects and policy in the City of Worcester, and increasingly, the CMMPO region. Technical support and analysis is provided for Walk Bike Worcester and TAG initiatives, including snow removal efforts during the winter and Complete Streets planning. Since the approval of Worcester's Complete Streets Policy in early 2018, staff anticipate increased participation with these groups in preparation of the Tier II Complete Streets Prioritization Plan.
- Safe Routes to School: As a key member of the Worcester Safe Routes to School Taskforce, staff have worked with the Worcester Public Schools System since 2016 to provide technical assistance to support multimodal transportation and safety planning.
- Bicycle and Pedestrian Advisory Committee (BPAC): The committee was restructured and revived for the 2018 Regional Bicycle and Pedestrian Plans to provide direction and input on the development of both networks in the CMMPO region. Representatives from various municipalities, regional departments, and community groups were invited to join.

Needs Assessment

Bicycle

The purpose of the bicycle plan is to provide a planning tool for the CMMPO region to develop a connected network of bicycle facilities that is safe, convenient, and continuous for residents and visitors. Through careful analysis of the GIS data gathered, meetings with planning and engineering staff, local leaders and stakeholders, and a public involvement effort, staff highlighted opportunities and constraints within the region. Additionally, staff evaluated bicycle network needs for commuting and recreation. The linking of local and regional recreation spaces with residential areas and commercial centers will improve the accessibility and

connectivity of the CMMPO region. The recommendations include policy and legislative changes as well as physical improvements to the transportation network. The intended result is a region that is well connected and friendly to cyclists of all abilities. The following four attributes should be considered when determining the needs of bicycling:

Connections – Safe and convenient connections between residential areas and recreational space will help the region's residents reach destinations via bicycle, reducing reliance on the automobile and generating positive health outcomes.

- Connections to transit are essential in urbanized areas that are concerned with being friendly to bicycle travel. A well-connected bicycle network can supplement the transit network by providing safe connections to and from origins and destinations that are not located directly along fixed route transit service.

Design - Connected facilities that are usable for all groups and ages will lead to a greater range of appeal. Separated and multi-use pathways are helpful to users who don't have the experience level of daily cycling commuters, as well as those that use alternative mobility devices. Facilities should be clearly marked when they are installed in on-road locations, with both pavement markings and signs to provide information to cyclists and drivers. Additionally, consideration should be given to bicycle racks at municipal parks and other public facilities.

- Up-to-date design standards are necessary when constructing the bicycle in order to provide an acceptable level of safety and connectivity.

Aesthetics – Consideration should be given to the design of recreational facilities in terms of proper lighting, shade from the summer sun, drinking water availability, and restroom facilities. This is especially important for longer facilities such as the Boston/Worcester Airline Trail and the Blackstone River Greenway.

- End of trip facilities, such as lockers, parking, bathroom/shower facilities, etc. have a positive effect on creating a region that is friendly to cyclists and other alternative travel modes.

Encouragement / Education – Public Safety Campaigns, Service Announcements, rules of the road, and training classes can provide encouragement for people who may be interested in cycling, but unsure of how to go about using the network. The CMMPO and local municipalities should coordinate efforts to encourage local residents and visitors to increase the level of bicycling. Highlights should include local ordinances, the promotion of the environmental and health benefits of cycling, and safety tips.

- Municipalities and CMMPO staff should work together to provide the most up-to-date information regarding bicycle network travel, available routes, maps, end of trip facilities, ways to report maintenance related issues, and more. All town websites as well as the CMRPC website should include relevant links regarding the bicycle network.
- Activities such as those that take place during Bay State Bike Week, with bike to work day, safety campaigns, and commuter incentive programs all help to encourage more residents to choose to bike to work or school. Educational campaigns should focus on the rules of the road for all transportation system users so that everyone on the road or other facilities knows their rights and responsibilities.
- A proactive enforcement approach from local police departments would go a long way to reduce rates of crashes and aggressive transportation system user behavior.

Pedestrian

The landscape of the CMMPO region varies widely - from rural and suburban to urban – all with different levels of accessible pedestrian infrastructure and various needs. Assessing pedestrian needs and conditions in the region included a comprehensive review of the existing walking conditions experienced by pedestrians. Staff approached the assessment by analyzing existing walking infrastructure inventories and feedback elicited through public outreach to determine the "walkability" of an area, or how friendly and/or safe an area is to walking. The analysis of existing conditions included looking at all available data on federal aid eligible roadway sidewalks, as well as available data from local sidewalk inventories, because sidewalks serve a dual purpose of a transportation system for commuters and recreational users who are enjoying exercise. Other data sets that were examined include projects that are programmed for construction in the near future, origins and destinations that are or could be popular for pedestrians, and existing opportunities and constraints that could play a role in how pedestrian infrastructure is developed in the future.

Commuter Needs

One of the main goals of the Regional Pedestrian Plan is to reduce reliance on the automobile for daily travel. In order to encourage daily commute trips via walking versus automobile and make the shift from automobile to walking more practical, the CMMPO and municipal governments should focus on providing a connected pedestrian network that not only has on and off-road facilities, but also emphasizes the following characteristics:

- A Convenient Network of Facilities – Sidewalks and paths should be installed to provide logical and safe connections between major attractors and generators, such as

residential areas and commercial districts. People who walk usually prefer sidewalks for their commute, however, greenways or other multi-use paths would also be beneficial to creating a robust network in the CMMPO region.

- End of trip facilities – Amenities such as benches, trash receptacles, pedestrian lighting, and water fountains should be located at larger employment centers or other popular destinations.
- Facility maintenance- Road debris and broken pavement and sidewalks can create very dangerous situations for pedestrians. An online system with a map component for reporting and addressing maintenance issues would go a long way to ensure a safe pedestrian network.
- Integration with WRTA and MBTA transit – In order to establish a truly interconnected transportation network, pedestrian improvements should be coordinated with regional transit planning whenever possible to provide a robust system that allows for efficient movement across modes.
- Safety & Enforcement – Up-to-date design standards are necessary when constructing the pedestrian network for the CMMPO region in order to provide an acceptable level of safety and connectivity. Furthermore, a proactive enforcement approach from local police departments would go a long way to reduce rates of crashes and aggressive transportation system user behavior.
- Information Availability – Municipalities and CMMPO staff should work together to provide the most up-to-date information regarding pedestrian network travel, available routes, maps, end of trip facilities, ways to report maintenance related issues, and more. All town websites as well as the CMRPC website should include relevant links regarding the pedestrian network.
- Encouragement – Activities such as those that take place during Bay State Bike Week, with bike to work day, International Walk to School Day, safety campaigns, and commuter incentive programs such as MassRIDES all help to encourage more CMMPO region residents to choose to bike or walk to work or school. Educational campaigns should focus on the rules of the road for all transportation system users so that everyone on the road or other facilities knows their rights and responsibilities.

Recreational Needs

The needs of recreational pedestrians are quite different from that of people who commute via walking. People who commute via walking typically prefer to travel along major roadways that provide the most direct connection between home and work. On the other hand, recreational

pedestrians often prefer to travel in loops through neighborhoods or along greenways that provide exercise, shade from the summer sun, visual variety, and other features. Nonetheless, a well-connected pedestrian network can serve as a place where people can interact, connect with nature, exercise, and simply enjoy all that the region has to offer. Development of an interconnected pedestrian network of sidewalks, multi-use paths, and signage will provide an opportunity to fill in and connect the gaps between parkland and residents, which should highlight the following features:

- Connections – Safe and convenient connections between residential areas and recreational space will help the region's residents reach destinations via walking, reducing reliance on the automobile and generating positive health outcomes.
- Design – Connected facilities that are usable for all groups and ages will lead to a greater range of appeal. Separated, multi-use pathways such as rail trails, greenways, or the Blackstone River Bikeway are helpful to users who don't wish to travel on busier roadways as commuters or recreational users, as well as those that use alternative mobility devices.
- Aesthetics – Consideration should be given to the design of pedestrian facilities in terms of proper lighting, shade from the summer sun, drinking water availability, and restroom facilities. This is especially important for longer facilities such as the Boston/Worcester Airline Trail and the Blackstone River Bikeway.
- Encouragement / Education – Public Safety Campaigns, Service Announcements, rules of the road, and training classes can provide encouragement for people who may be interested in walking, but unsure of how to go about using the network. The CMMPO and local municipalities should coordinate efforts to encourage local residents and visitors to increase the level of pedestrian activity in the region. Highlights should include local ordinances, the promotion of the environmental and health benefits of walking, and safety tips.

Prioritization

Bicycle

Table IV-1 shows the top 10 High Priority Bicycle Crash Locations in the CMMPO region. For the purposes of the Long Range Transportation Plan, the top seven crash cluster locations are eligible for HSIP funding through the Transportation Improvement Program (TIP). Although the remaining four intersections are not HSIP eligible, they are still a priority. The majority of these crash cluster locations are within the City of Worcester while only one is located in the town of

Webster. Most crash cluster are concentrated along Main Street, Chandler Street, and Park Avenue. A Road Safety Audit must be completed for any HSIP funded TIP project. Please see the *2018 CMMPO Regional Safety Report* that includes years 2013-2015 for expanded discussion regarding other non-HISP eligible bicycle crash clusters.

Table IV-1: CMMPO High Priority Bicycle Crash Clusters

Crash Count	# Fatal	# Injury	# Non-Injury	EPDO	Location	Community
13	0	9	4	49	Main St/King St/May St	Worcester
16	0	8	8	48	Chandler St/Park Ave	Worcester
10	0	9	1	46	Belmont St	Worcester
12	0	6	6	36	Main St/Murray Ave	Worcester
7	0	6	1	31	Madison St/Francis J.	Worcester
9	0	5	4	29	Chandler St/Irving St	Worcester
7	0	5	2	27	Park Ave/Mill St	Worcester
9	0	4	5	25	Madison St/I-290	Worcester
6	0	4	2	22	Chandler St	Worcester
4	0	4	0	20	East Main St	Webster
4	0	4	0	20	Lincoln St/Country Club	Worcester

Pedestrian

Table IV-2 shows the top 10 High Priority Pedestrian Crash Locations in the CMMPO region. For the purposes of the Long Range Transportation Plan, the top seven crash clusters locations are eligible for HSIP funding through the Transportation Improvement Program (TIP). Although the remaining four intersections are not HSIP eligible, they are still a priority. All but one location is within the City of Worcester. These locations are concentrated on Main Street, Chandler Street, and Park Avenue. A Road Safety Audit must be completed for any HSIP funded TIP project. Please see the *2018 CMMPO Regional Safety Report* that includes years 2013-2015 for expanded discussion regarding other non-HISP eligible bicycle crash clusters.

Table IV-2: CMMPO High Priority Pedestrian Crash Clusters

Crash Count	# Fatal	# Injury	# Non-Injury	EPDO	Location	Community
90	0	63	27	342	Main St/Foster St	Worcester
28	1	21	6	121	Grafton St/Hamilton St	Worcester
31	1	20	10	120	Pleasant/Merrick/West	Worcester
25	2	18	5	115	Chandler St	Worcester
33	0	19	14	109	I-290/Harding St	Worcester
27	0	19	8	103	Belmont St/I-290	Worcester
25	1	17	7	102	Main/Freeland/Maywood	Worcester
26	0	19	7	102	Main St/Cambridge St	Worcester
20	0	19	1	96	Belmont St	Worcester
24	0	17	7	92	Main St/Murray Ave	Worcester
23	0	15	8	83	Main St/May St	Worcester

Next Steps

Bicycle

It is the hope of this plan that all forty of the CMMPO member municipalities move toward the adoption of the strategies that have been outlined in this section as well as the Regional Bicycle Plan in order to achieve the ultimate goal of a well-connected regional bicycle network. Through the MassDOT engineering directive and the Complete Streets Funding Program, a number of CMMPO municipalities have already begun to take the necessary steps toward incorporating the development of the bicycle network into their policies, programs, and infrastructure planning. The strategies involve policy adoption, creation of positions or committees, or outreach strategies to further the goals of the plan. The strategies listed below are potential actions by CMMPO member municipalities that will help achieve the goal of developing a regional bicycle network.

- Adoption of the CMMPO Regional Bicycle Plan. Bicycle network planning should be incorporated into a municipality's planning process, with land use development and future transportation plans reflecting compliance with this plan
- Utilize the MassDOT Complete Streets Funding Program process to create and adopt local Complete Streets policies and prioritization plans to continue to close the gaps in the bicycle network
- Work with MassDOT to ensure that arterial and collector streets with excess shoulder width are closely examined to determine how quickly they can be converted into Complete Streets with bicycle facilities in place
- Work with local, regional, and statewide advocacy groups and other stakeholders to expand public and education campaigns that promote the rules of the road to educate all transportation users of their responsibilities. Additionally, the encouragement, promotion, and incorporation of Safe Routes to School and Bay State Bike Week materials and program information through promotional events to garner and community involvement and interest
- Better integrate the CMMPO Bicycle and Pedestrian Advisory Committee into the planning efforts of the CMMPO.

Pedestrian

Consistent with MassDOT's Pedestrian Plan Vision Statement, the CMMPO regional vision for pedestrian transportation highlights the development of safe, convenient, and comfortable

walking options. It is important that CMMPO member municipalities review and adopt the strategies that have been outlined in this section as well as the Regional Pedestrian Plan in order to achieve the ultimate goal of developing a well-connected regional pedestrian network and improving existing systems. In recent years, most preexisting federal and state pedestrian transportation programs have supported elements of what is now Complete Streets. The strategies listed below are potential actions that will help CMMPO member municipalities to facilitate the expansion and upgrade of the pedestrian facilities in the region:

- Adoption of the CMMPO Regional Pedestrian Plan. Pedestrian network planning should be incorporated into a municipality's planning process, with land use development and future transportation plans reflecting compliance with the plan
- Coordinate and advocate for pedestrians among a diverse set of federal, regional and local stakeholders
    - Collaboration with the CMMPO through a continuing, comprehensive, and cooperative multimodal transportation planning process ("3C Process")
    - Participation in trainings, conferences and other events
    - Monitoring performance
    - Promote increased safety
- Engage with Complete Streets technical assistance program as a principal pedestrian planning effort, including Safe Routes To School Program
    - Utilize the MassDOT Complete Streets Funding Program process to create and adopt local Complete Streets policies and prioritization plans to continue to close the gaps in the pedestrian network i.e. sidewalks, crosswalks, ramps, etc.
    - Work with CMRPC and MassDOT to identify potential for shared use or multi-use paths along right-of-ways, including rail trail planning as appropriate
- Continue policy, regulation, and design guideline development to create and enhance pedestrian activity
    - Participation in the Massachusetts Bicyclist and Pedestrian Advisory Board (BPAB);
    - Initiating new data collection activities, i.e. Working with walking and path/trail advocacy organizations to update facility data and to generate usage information
    - Encourage pedestrian accommodations and/or healthy corridor planning into community design guideline projects. For example, CMRPC offers its communities technical assistance for revising local ordinances and design standards to promote Complete Streets principles. Staff are working with the

Town of West Boylston to develop a Village Center District including transportation and streetscape design components to support pedestrian mobility.

- Work with local, regional, and statewide advocacy groups and other stakeholders to expand public and education campaigns that promote the rules of the road to educate all transportation users of their responsibilities.
    - Improving facility and use data collection;
    - Pedestrian safety analyses/project development
    - Managing shared-use of public rights-of-way
- Increased pedestrian planning and application for capital investments through state programs and grant opportunities such as the Community Compact Cabinet, Housing Choice Initiative, and MassWorks Infrastructure Program. For example, as part of the Community Compact Best Practices Program, the Transportation/Public Works Best Practice Area supports adopting Safe Routes to School programs, adapting streets to accommodate people using all modes of transportation, and promoting safety and mobility for older drivers. Additionally in 2018, the Town of Amherst received Housing Choice funding for upgrades to the town center sidewalk system for improved connections to local bus stops.
- Explore and manage shared mobility devices. At present, shared mobility in the region is taking the form of Worcester-based bikeshare programs. CMRPC will use resources such as those developed by the National Association of City and Town Officials (NACTO) to assist its communities in developing municipal guidelines for regulating shared mobility devices. CMRPC's focus is upon assisting its communities now and in the future with the use of shared mobility devices in public spaces, particularly roadways, sidewalks and trails, so that these devices do not create ADA accessibility or public safety hazards for pedestrians.
- Better integrate the CMMPO Bicycle and Pedestrian Advisory Committee into the planning efforts of the CMMPO.

Public Transit and Passenger Rail

Overview

Public transportation is intended to serve the general public's trip making needs, including the needs of transit-dependent populations. The core of the CMMPO region's public transportation network has long consisted of traditional fixed route bus services, public and client-based paratransit services, and certain taxi and livery services that have operated under contract to the Worcester Regional Transit Authority (WRTA). In addition, intercity bus, MBTA Commuter Rail, and Amtrak intercity rail services are included in this Section as public transportation resources for the region, but serve trip origins and destinations in adjoining or more distant regions.

Since Mobility2040 (2015) was released, significant public transportation industry developments have occurred:

- Fewer residents whose commutes start and end in the CMMPO region use local public transportation; however, the region's use of MBTA Commuter Rail to access the Boston job market is reportedly increasing;
- The range of intercity bus operators operating through the region have expanded, offering both low-cost and premium services targeted to very specific markets;
- Intercity bus customers with trip starts/ends in the region remain served by two long-established operators, though as of 2017 these operators no longer coordinate fares and schedules;
- Overall WRTA system ridership increased between FYs 09-16; however, WRTA's share of all trips in the region (5%) remained relatively unchanged.
- WRTA ridership declines accelerated in FYs 2017-2018, slowing in FY 2019 to date;
- Interest in on-demand transportation – particularly ridesharing – emerged in the region in FY 2016; is growing rapidly, and is projected to expand;
- Use of for-hire transportation (taxi) use is believed to be declining, and
- Institutional transportation (i.e. 'eds and meds') services are proliferating.

Contributing factors that are presently operative:

- Improved economy since 2008 – particularly after 2014;
- Increased use of mobile devices for information sharing;
- Stable or declining motor vehicle fuel prices – after 2015;
- Increased availability of vehicle financing incentives;

- Increased flexible work schedules and telework;
- Continued aging population and increased demand for elder transportation;
- Increased Commonwealth investment in MBTA Commuter Rail – more trips, improved scheduling, and infrastructure upgrades, and
- Proliferation of low-cost intercity bus operators, schedule/fare incentives, and service amenities.

For a decade or more, planning and transportation industry trend reporters have attributed transit ridership growth trends to fundamental lifestyle changes of the millennial generation favoring transit use – at least, in the larger US metropolitan areas (much attention is focused upon Millennials, as they are expected to become the largest population cohort in 2019[1]). Notably, even in such areas ridership on local transit systems across the U.S., has declined, with very few exceptions. This cohort's predicted use of local transit in the CMMPO and many other regions, cited by many industry professionals as an indicator of permanent lifestyle changes prior to 2016, has not materialized; in fact, its behaviors point to increased use of personal vehicles, ridesharing/shared mobility options and other forms of private transportation. However, the region's demand for public transportation serving elders, persons with disabilities, and low-income populations remains prominent.

Fixed Route Transit

The WRTA operates fixed-route bus transportation in the thirteen communities shown in Table IV-3 below:

Table IV-3: WRTA Fixed-Route Communities

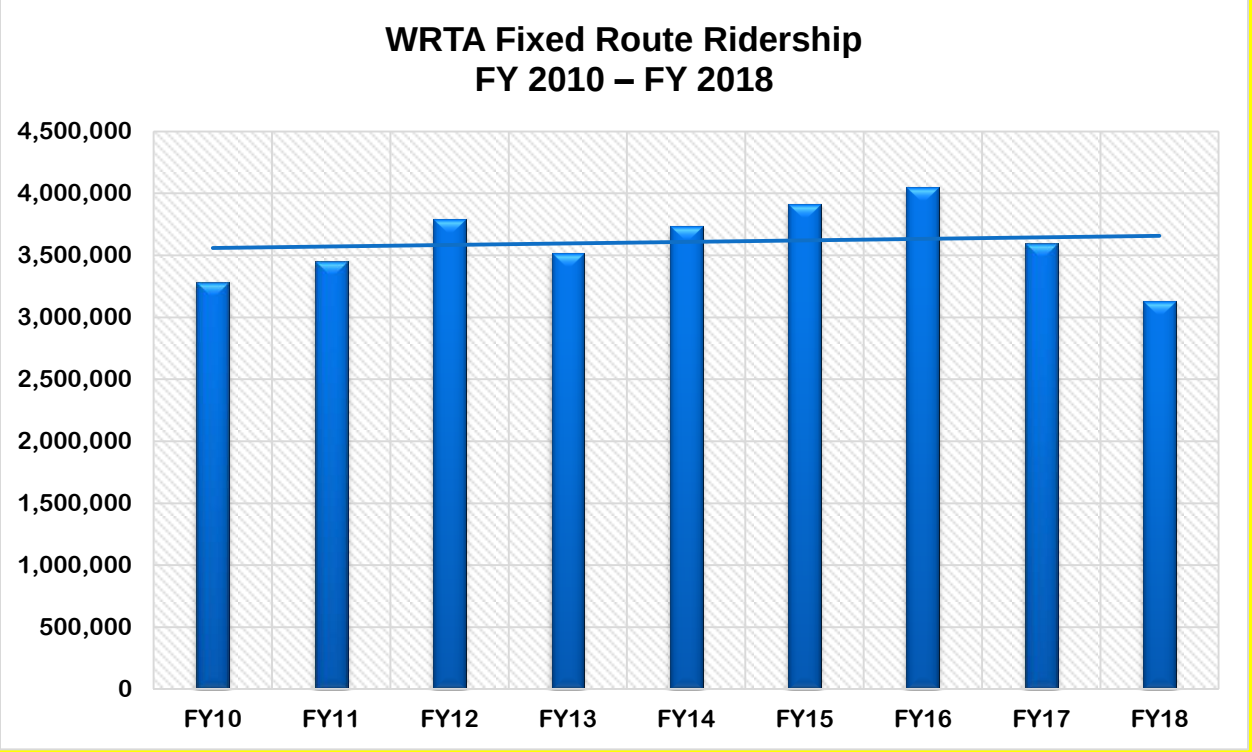
Auburn	Leicester	Southbridge
Brookfield	Millbury	Spencer
Charlton	Oxford	Webster
East Brookfield	Shrewsbury	West Boylston
Worcester		

In addition, WRTA operates Community Shuttle services in Grafton, Northbridge, and Westborough. These services have been developed to match potential local transit demand in the region's communities with available funding. In total, the WRTA operates 41 vehicles in

[1] http://www.pewresearch.org/fact-tank/2018/03/01/millennials-overtake-baby-boomers/

peak fixed-route service over a network of over 350 route miles. Figure IV-1 shows the WRTA Fixed Route Ridership data between 2010 and 2018.

Figure IV-1



Paratransit

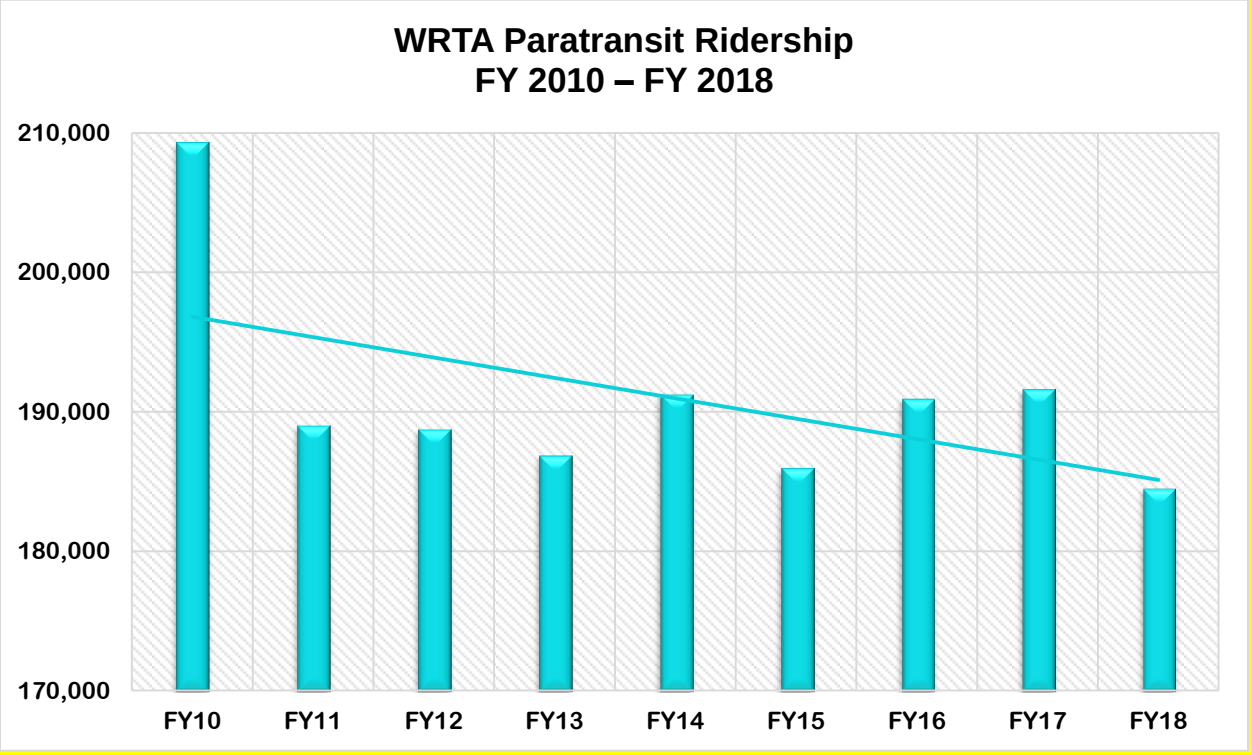
The WRTA owns, operates, and maintains most of the region's paratransit assets. It also contracts with other entities to operate paratransit services, which are provided in two forms: 1) Americans with Disabilities Act (ADA), and 2) Non-ADA paratransit.

- ADA paratransit services operate within ¾ mile of WRTA fixed route bus services. They are either operated under contract by the WRTA Van Division, or by local Councils on Aging (COAs), and other providers. ADA services mirror hours and days of fixed-route service, and
- Non-ADA paratransit services are operated under contract to transport elders and persons with disabilities outside of the ADA service area. These services generally operate on weekdays from 8am-4pm.

Paratransit capital funding consists of a combination of FTA, MassDOT and 'local' resources. Vehicles and ancillary equipment (and occasionally operating funds) are awarded through MassDOT's Community Transit Grant Program. Such funds are requested by the WRTA and

local Councils on Aging, and if awarded are programmed in the CMMPO's Transportation Improvement Program (TIP). Such funds have allowed moderate WRTA paratransit service span expansions in Shrewsbury, Millbury, and in rural areas of central Massachusetts offering midday service to Worcester. ReadyBus (operated by SCM Elderbus) continues to make use of such funding to accommodate work trips in four more rural communities. Figure IV-2 shows the WRTA Paratransit Ridership data between 2010 and 2018.

Figure IV-2



The CMMPO Transit staff fulfills two key roles concerning paratransit:

- Coordination of region-wide paratransit service planning. It has performed such work for many years, which after 2010 (in accordance with Executive Order 530) was expanded as part of the Central Massachusetts Regional Coordinating Council.
- Conduct local service planning and programming funds. The staff performs such work for the WRTA and for Councils on Aging (CoAs) that operate paratransit service using FTA/MassDOT-funded assets.

Intercity Bus

Intercity bus operators compete directly with airlines, passenger rail, and single-occupancy vehicles for customers. Intercity bus services are particularly important to rural areas and

smaller communities that lack nearby air and passenger rail service. Industry officials advise that intercity bus routes have attracted more riders with lower fares than other modes, and bus carriers responded by adding routes and schedules to accommodate ridership demand. The intercity bus industry has grown considerably in the past decade.

The CMMPO region, as it is Massachusetts' second largest urbanized area and New England's third largest urbanized area (after Boston and Providence), generates significant intercity bus passenger demand. Worcester's Union Station Intermodal Transportation Center (ITC) is the region's principal intercity bus facility, which is served by Peter Pan Bus Lines and Greyhound. Both bus operators connect at Union Station with MBTA Commuter Rail, Amtrak passenger rail, and taxi services – and to WRTA's local transit system. In addition, Greyhound offers limited service access in Sturbridge, while Peter Pan serves a Park and Ride facility in Millbury. Both operators' services either directly, or through other operators, serve both regional and national travel markets.

Several bus operators' services are accessible to the region from other service locations, such as Boston, Springfield, and Hartford, CT.

Amtrak Intercity Rail

The region is served by the National Passenger Rail Corporation (Amtrak), which was established as a U.S. government-owned corporation in 1971 to provide intercity passenger train service throughout the United States. Amtrak provides direct service to the region at Worcester's Union Station. Refer to the Passenger Rail subsection of this Chapter for additional information.

Performance Management

As discussed in Chapter II of this report, federal laws require performance based planning that supports it planning emphasis areas. Although not directly related, public transit and passenger rail does contribute to FHWA rules PM1 (Safety) and PM3 (Congestion). Please refer to Chapter II or the Safety and Congestion sections within this chapter for more information on those measures. Below is a list of specific CMMPO Performance Management goals and objectives from various federal emphasis areas that involve transit. Those goals and objectives that are related to transit are as follows:

Goal 1 – Improve transportation accessibility for all modes by improving roadway infrastructure.

- Reduce mileage of sidewalks in poor condition by 10% over 10 years.

- Increase the number of ADA compliant ramps in the region by 100 per year for a total of 2,975 compliant ramps in 10 years.

Goal 2 – Expand the bicycle, pedestrian, and transit network in the region.

- Add 200 miles of bicycle and pedestrian facilities by 2040.
- Continue the downward trend of the reduction of drive alone commute mode.

Goal 3 – Achieve geographic and population equity across the region.

- Maintain or increase the % of EJ population that intersect WRTA bus routes.

In addition to the above mentioned goals, the FTA published a TAM Final Rule to help achieve and maintain a State of Good Repair (SGR) for the nation's public transportation assets (outlined in Chapter 2). Under the FTA rule, the WRTA is considered a Tier II Provider which is a recipient of FTA funds that owns, operates or manages 100 or fewer vehicles in revenue service during peak regular service across all non-rail fixed route modes or in any one non-fixed route mode. The TAM final rule includes:

- Definition of the term "state of good repair"
- Requires grantees that receive FTA dollars to develop a TAM Plan
- Establishes TAM performance measures
- Establishes requirements that transit agencies will follow when reporting annually to the National Transit Database
- Requires FTA to provide technical assistance to support implementation of this rule

This rule also requires MPOs to set performance targets for the TAM performance measures for their regions in coordination with transit and state agencies.

The CMMPO and WRTA have participated and will continue to participate in fulfilling the TAM rule requirements and in working towards a SGR for the CMMPO region. Tier II transit providers are to assess SGR for three categories of capital assets. Table IV-4 describes the three performance measures and the targets established by the WRTA for FY18.

TABLE IV-4
WRTA TAM Performance Targets

Asset Category	Relevant Assets	Performance Measure/Target	Measure Type	Desired Direction of Measure
ROLLING STOCK	Buses > 30'	100% of fleet meets or exceeds ULB of 12 years	Age-based	Minimize percentage
	Buses ≤ 30'	100% of fleet meets or exceeds ULB of 10 years	Age-based	Minimize percentage
	Demand Response Vans	100% of fleet meets or exceeds ULB of 5 years	Age-based	Minimize percentage
EQUIPMENT	Support Vehicle	100% of fleet meets or exceeds ULB of 4 years	Age-based	Minimize percentage
FACILITIES	Admin / Maintenance Facility	0% of facilities rated under 3.0 on TERM Scale	Condition-based	Minimize percentage
	Passenger / Parking Facility	0% of facilities rated under 3.0 on TERM Scale	Condition-based	Minimize percentage

Two definitions apply to these performance measures:

- **Useful Life Benchmark (ULB**) – The expected lifecycle of a capital asset for a particular transit provider's operating environment, or the acceptable period of use in service for a particular transit provider's operation environment. For example, FTA's default ULB is 14 years.
- **FTA Transit Economic Requirements Model (TERM) Scale** – A rating system used in FTA's TERM to describe asset condition. The scale values are 1 (poor), 2 (marginal), 3 (adequate), 4 (good), and 5 (excellent).

Owing to the WRTA's new facilities and relatively modern fleet, it met each of its FY18 targets. The WRTA proposes to use the same performance targets for FY19; these will be incorporated into its first Transit Asset Management (TAM) Plan, which is now being finalized for submittal to FTA. Going forward, the WRTA (and all transit providers) will update their TAM plan at least

every four years, and update the CMMPO annually on performance targets, investment strategies, and an annual condition assessment as is required under 49 CFR§625.53.

Congestion / On-Time Performance

Background

CMMPO defines most transit congestion in the context of external factors, i.e. transit vehicles operating in mixed traffic on intensively-used roadways and intersections. These same roadways and intersections may also have design issues that constrain all traffic or transit vehicles in particular. In addition, traffic controls (signals) and parking management are often contributing factors: many intersections in communities with high volume roadways operate at low Levels of Service (LOS) during peak AM and PM periods. Finally, external or in-system emergencies involving public safety personnel; weather conditions and construction projects also generate non-recurring congestion that affect public transit performance.

Other transit congestion is attributable to internal factors such as:

- Fixed routes: schedule adherence, vehicle and facility capacity, route bunching, and
- Paratransit: trip reservations system performance; ability to schedule trips; operator on-time performance, and vehicle utilization (multiple pick-ups or drop offs at one location with limited ability to consolidate trips).

Transit Congestion Reduction and On-time Performance Improvement Tasks

- Data collection improvements for monitoring and reporting on standards for different operating periods of the day
- Enforcement of rules and regulations currently in existence
- Improvements to initial and continuing operator training
- Prepare schedule for changes in equipment assignments (e.g. vehicle rotation)
- Improved communication protocols between WRTA dispatchers, inspectors and operators, as well as local public works and local police departments, to minimize service disruptions due to external emergencies, inclement weather and/or construction projects
- Encourage reduced use of single occupant vehicles, and increased use of multi-modal, healthy, active transportation options, to reduce overall roadway congestion

Analysis

Roadway Operations: Relationship to Travel Times and Transit On-Time Performance

The Transportation staff conducts congestion analyses in various locations across the region. Between 2011 and 2018, the CMMPO staff analyzed thirteen such locations (see Table IV-10).

- The WRTA operates fixed-route service in eleven of these locations excepting MA-20 in Northborough (between Church and Hudson Streets) and MA-122A in Holden (between Shrewsbury Street and MA-68);
- WRTA, its contractors, and Councils on Aging operate paratransit services in all thirteen locations, and
- While intercity bus operators serving the region do not generally operate in these locations, they routinely encounter congestion on I-90, I-290, US-20, MA-146, and the local street network around Worcester's Union Station.

CMMPO Transit and WRTA staffs jointly monitor and analyze transit on-time performance according to:

- WRTA fixed-route and paratransit travel times by trip origin and destination, and
- WRTA fixed-route on-time performance according to schedules and timepoints.

This work utilizes data collected by the WRTA's Automatic Vehicle Locator (AVL) technology, and periodic field checks. Additional on-time performance factors include:

- Mechanical failures;
- Schedule design (fixed route);
- Scheduling and dispatching (paratransit), and
- Inadequate operator training and control.

While traffic delays are beyond transit operators' immediate jurisdiction, operators can plan or schedule trips to provide sufficient time under normal traffic conditions. As street traffic varies by season, day of week, and hour of day, the WRTA and other transit operators adjust schedules at different times of the year. In instances where paratransit trip schedules become difficult during peak periods by reason of general traffic volume, operators can provide some trips using different routes. Disruptions due to mechanical failure of equipment cannot be eliminated but should be minimized within the economic limits of sound maintenance practices.

The WRTA utilizes weekly construction detour information generated by the City of Worcester to spot and address potential operations problems before they occur. Concurrently, MassDOT has made progress in ensuring that corridor projects it sponsors accommodate transit operations. MassDOT also offers technical assistance to communities for their transportation projects to accommodate transit.

In peak periods when general traffic volumes routinely impact transit schedule adherence, the WRTA and other transit providers modify their schedules for that particular situation or utilize detours and route modifications as required. The operators continuously work to eliminate or minimize equipment and vehicle issues that could impact transit service reliability.

Fixed routes operating on frequent headways, particularly on roadways with high traffic volumes, are less likely to adhere to schedule than those which operate on less frequent headways or in "off peak" service. Accordingly, Table IV-5 below shows different existing WRTA schedule adherence standards based upon a particular service's headway frequency:

Table IV-5 WRTA Fixed Route Schedule Adherence (Targeted Percent of On-Time Service) – source: WRTA Service Standards (2012)

Operating Period	30 Minutes and Less Headway	Over 30 Minutes Headway
Total Peak Period	85%	95%
Base (Non-Peak)	95%	95%
Saturday, Sunday and Holiday	95%	95%

While the above values are recommended standards for fixed-route schedule adherence, actual performance in the field since 2012 has proven them unrealistic. The WRTA's use of real-time data since 2012-2013 to measure schedule adherence shows the progressive impact of factors beyond the WRTA's control, such as increased traffic volumes and congestion, construction and incidents. Further, WRTA reports on-time performance to MassDOT and NTD as the percentage of all scheduled trips completed.

For intercity bus operations, CMMPO staff is not directly engaged with operators on congestion and on-time performance pertaining to their internal operations; however, the staff monitors and plans for improvements on those roadways the operators use. Currently, staff has been working with MassDOT and the City of Worcester to design roadway and traffic management improvements in and around Kelley Square, and the CMMPO has programmed funds for the reconstruction of Grafton Street (FFY 2019). Similar projects are or will be programmed in successive TIP years.

Actions to Minimize Transit Congestion and Maximize On-Time Performance

To minimize congestion and maximize on-time performance for all transit services, certain roadways and intersections should be improved first. These prioritized locations should have improvements that will alleviate congestion and reduce travel time, particularly where they impact high transit routes. Performance measures help determine if a project should be

undertaken as a result; a project that benefits multiple modes or management systems will get a higher priority over a proposed project that only helps one element.

The CMMPO staff assists the WRTA with maintaining or improving schedules that meet on-time performance. To do this, staff analyzes WRTA data that is collected by its vehicle technologies, as well as data generated by CMMPO's travel demand model. From this data, staff identifies the locations of critical peak hour delay and determines which roadway segments should undergo improvements to reduce travel time and potential bottlenecks.

Where feasible, staff will continue monitoring opportunities to connect transit with existing Park-and-Ride facilities and support improvements to these facilities. Staff will also support statewide, regional and/or local rideshare programs as they evolve – in the broad implementation of Travel Demand Management (TDM). Table IV-6 below is a list of roadways used intensively by the WRTA to provide fixed-route transit service that are primary corridors for roadway congestion during peak travel hours:

Table IV-6: Congested roadways

Belmont Street	Lincoln Street
Chandler Street	Main Street
Gold Star Boulevard	Pleasant Street
Grove Street	Southbridge Street
Highland Street	West Boylston Street

To minimize congestion and maintain or improve on-time performance for paratransit, the following actions are active or recommended:

- Continue WRTA internal monitoring of paratransit service congestion and potential capacity constraints according to trip requests – such as performance according to pickup and drop-off times, pickup windows, and trip travel times.
- Manage paratransit trip coordination so as to use vehicles and trips to maximum potential. A longstanding goal has been to transport (a minimum) of 2.5 passengers per hour. To increase vehicle and trip efficiencies, the WRTA implemented the Mobility Management Model (MMM) several years ago. MMM, initially piloted by two Councils on Aging, expanded to eight communities: Auburn, Boylston, Leicester, Northborough, Oxford, West Boylston, Westborough, and Worcester.
- Expand customer use of WRTA Travel Training. The WRTA offers travel training to the general public including paratransit riders who could transition to the fixed-route system.

Fixed-route service fares are less expensive and also do not require a customer to schedule a trip in advance.

- Advance fare payment options. In January 2019, the WRTA implemented an online paratransit fare payment option for paratransit customers. This enables riders to manage their accounts, including adding funds, at their convenience. It also reduces or eliminates the customer's need to mail or present payments in-person at the WRTA Customer Service office.

Needs

CMMPO and the WRTA are working to develop or implement the following:

1. Agreement between MassDOT, WRTA, and within WRTA on how transit on-time performance will be defined (in progress, 2019). For this Plan, existing goals and targets will be retained. CMMPO Transit staff will continue working with the WRTA, MassDOT and the Commonwealth's Task Force on RTA Performance and Funding (2018-2019) to determine mutually agreeable, realistic, on-time performance standards.
2. Online paratransit trip reservations scheduling system. The WRTA is pursuing funding to design an online paratransit trip reservations system. If implemented, the WRTA will be able to offer customers the ability to book and manage their trips at any hour or day, thus reducing demands upon the WRTA's reservationists during normal business hours.
3. Short-term improvements, including:
    - Signal timing and phasing adjustments, and
    - Traffic control signage and pavement marking maintenance.
4. Real-time technologies to improve communication between transit operators and:
    - External parties: entities that own or are responsible for operation of infrastructure used by transit, and
    - Internal parties: transit operations supervisors and vehicle operators.
5. Long-term transit congestion improvement options:
    - roadway and intersection redesigns/reconstructions;
    - existing dedicated transit lanes, or
    - Intelligent Transportation Systems (ITS) capability or tool installations – particularly Transit Signal Priority (TSP) at key intersections along congested routes.

Plans Supporting Transit Congestion Reduction and On-Time Performance

- WRTA Service Standards revision (planned, 2019)
- WRTA Severe Weather Plan (2018)

- WRTA Maintenance Plan updates (various)
- WRTA Transit Asset Management Plan (new, 2018)

Safety and Security

Background

There are four dimensions of transit safety and security:

1. Operations and Operators;
2. Passengers;
3. General Public Safety, and
4. Hazards and Incidents.

Safety and security aspects of transit have expanded in recent years, owing to societal changes and increased emphasis upon emergency planning/civil preparedness.

Regional and Local Safety and Security Coordination: The WRTA actively participates in the Central Region Homeland Security Advisory Council (CRHSAC), one of five such councils coordinated by the Executive Office of Public Safety and Security (EOPSS). The WRTA works closely with municipal police departments in its Service Area to monitor potential issues and promptly address any incidents.

Transit Personnel and Rider Safety and Security: the WRTA continues to train its Operations and Customer Service staffs on conflict de-escalation, and has upgraded security equipment at the Hub and installed driver protective enclosures on its fixed-route buses. Concurrently, WRTA contributes funding to City of Worcester toward its costs of operating a police substation within Worcester Union Station. In addition, WRTA Operations staff work closely with contracted security personnel at the WRTA Hub and at Union Station.

Specific to paratransit, WRTA paratransit drivers are trained to proficiency on Accessible Lift Use and Securement, Defensive Driving and Disability Awareness. This is done by in-house trainers or through the Massachusetts Rural Transit Assistance Program (MArtap).

The WRTA Safety Management System integrates safety into all of its Operator's activities, from planning to operations to maintenance. Further, the WRTA's Safety and Security Program Plan serves as a detailed blueprint for all security activities. Additionally, the WRTA Continuity of Operations Plan (COOP) presents a management framework, establishes operational procedures to sustain essential functions, and guides the restoration of full functions if normal operations in one or more of the WRTA's locations are infeasible. Finally, the CMMPO staff, in conjunction with Montachusett Regional Planning Commission (MRPC) under CRHSAC's guidance, has developed an Evacuation Plan for all of Worcester County.

Analysis

WRTA Safety Management System (SMS)

The WRTA SMS establishes:

- organization staff responsibilities and accountabilities;
- safety goals and performance targets, and
- policies and procedures for integrating safety into daily operations.

WRTA uses it as a tool for preventing accidents by integrating safety in all activities.

WRTA Safety and Security Program Plan (SSPP)

This is the WRTA's comprehensive security and emergency preparedness program. It outlines organization-wide security and emergency preparedness activities and its decision-making process for operations, passengers, employees and communities. It serves as a detailed blueprint for all security activities by:

- establishing how security activities are organized;
- outlining employee and department security responsibilities;
- instituting threat and vulnerability identification, assessment, and resolution methodologies; and
- setting goals and objectives (including periodic drills and Plan audits).

SSPP elements include an Emergency Action Plan, Homeland Security, Relocation Procedures, Evaluation of Emergency Preparedness, and Security Committee. The SSPP is updated continually to record and evaluate past system security performance, identify needed modifications, and establish the upcoming year's objectives.

Continuity of Operations (COOP) Plan

The WRTA Continuity of Operations (COOP) Plan establishes a continuity of operations management framework, operational procedures to sustain essential functions, and guides restoration of full WRTA functions if normal operations in one or more of the WRTA's locations are infeasible.

Basic COOP elements are: essential functions, critical systems, alternative facilities, orders of succession, delegations of authority, and vital records.

Worcester County Evacuation Plan

CMMPO staff, in conjunction with the Montachusett Regional Planning Commission (MRPC) and with the support of the Central Region Homeland Security Advisory Council (CRHSAC), has completed four phases of an Evacuation Plan for all of Worcester County. The Plan's purpose is

to provide Worcester County emergency management personnel with a comprehensive Regional Evacuation Plan. Phase I involved data gathering and data analysis. Phase I (a) provided an initial data inventory and assessed readily accessible data and conditions. Phase I (b) is a continuation of the work completed in Phase I (a), filling any data voids and working with municipalities to identify evacuation zones, evacuation routes, and traffic control points. Phase II aided jurisdictions in practical application and use of the "Tool Kit" that local, regional and state organizations can utilize to access the data during actual events. This was accomplished through the development and delivery of training workshops and exercises to assure jurisdictions have the knowledge and capabilities to utilize this data during an actual event. Phase III consisted of two Table Top Exercises to identify and test communications strategies needed in the event of a Worcester County Evacuation. Also, Phase Three aided jurisdictions in practical application and use of the "Tool Kit' and Evacuation Application. This was being accomplished through the development and delivery of training workshops and exercises to assure jurisdictions have the knowledge and capabilities to utilize this data during an actual event. Phase IV mapped all the limited access highways I-84, I-190, I-290, I-395, I-495, MA-2, and MA-146 evacuation routes. The routes were developed with input from the cities and towns that would be affected as well as the WRTA and Montachusett Regional Planning Commission. The intent of the alternate routes is to efficiently and effectively handle the redirected traffic around an incident so that it can reenter the highway as quickly as possible.

Transit Safety and Security - Roadway Operations

The CMMPO's Safety and Security focus is operational safety on priority roadway segments identified in this Plan's Highway Safety Section:

- *MA-9 (Belmont/Highland Streets, between West and Rodney Streets* (WRTA Routes 3, 24/24A, and 40).
- *Main Street between Martin Luther King Jr. Boulevard and May Street* (WRTA Routes 6, 7, 19, 27, and 33 operate along Main Street for their primary routing.
- *MA-9/12, Park Avenue between Elm and Chandler Streets* (WRTA Routes 7 and 31 operate along Park Avenue near this section, though no WRTA Routes utilize this specific section; and
- *MA-122/122A, Vernon/Madison/Chandler Streets, I-290 to Park Avenue* (no WRTA routes operate along Madison Street. WRTA Routes 4 and 11 operate through Kelley Square; east of the Square, Route 11 operates along Vernon Street while Route 4 operates along Harding Street. (OB) and Millbury St. (IB). WRTA Routes 6, and 7 operate in segments of Chandler Street.

- As outlined in the Highway Safety and Fixed-Route Transit sections, segments of three state-numbered routes in the CMRPC region contain "super clusters" of motorist, bicyclist, and pedestrian crashes. These segments constitute the region's three top crash corridors. Nearly all of the WRTA's services either operate along the corridors or crossover at specific intersections.

Needs

The WRTA (with CMMPO assistance) will:

- update its SSPP, SMS, and COOP as needed;
- continue participating in CRHSAC regional emergency response planning, and
- continue working through CMRPC to advance Complete Streets techniques for roadway projects in the region, particularly in the vicinity of bus stop waiting areas.

State of Good Repair

Background

Transit State of Good Repair (SGR) is a significant component of the CMMPO's overall SGR responsibilities. The Worcester Regional Transit Authority (WRTA), as the region's principal public transportation provider, is the chief organization responsible for local public transit SGR. Accordingly, Mobility2040's SGR content prioritizes WRTA and WRTA-contracted services. The MBTA, as the operator of the Framingham-Worcester Commuter Rail Line, implements its own SGR process.

The WRTA's extensive facility, vehicle and technology investments are well documented in this and previous plans. In 2018, the WRTA and other FTA grantees advanced SGR practices in the development of Transit Asset Management (TAM) Plans. The WRTA TAM Plan identifies WRTA asset priorities, sets facility, vehicle and equipment performance goals and targets, and provides for reporting progress against such targets through the CMMPO and National Transit Database (NTD) processes. The expectation is that transit organizations will use their TAM Plans to show their progress in achieving SGR and to improve SGR practices as well.

Asset Inventory

Facilities

WRTA Hub at Union Station

Figure IV-3 shows the WRTA Hub at Union Station (opened in 2013) at 60 Foster Street, Worcester provides a seamless connection between WRTA local transit and MBTA Commuter Rail, Peter Pan and Greyhound intercity bus, Amtrak and local taxi services at Union Station. It has an enclosed waiting area, restroom facilities, next bus arrival and departure displays and announcements, ticket vending machines, a Customer Service window, and a refreshments vendor. It also houses WRTA Administration and paratransit brokerage staff. The platform area can simultaneously accommodate up to eight buses.

Figure IV-3: WRTA Worcester Union Station Hub

Maintenance and Operations

As shown in Figure IV-4, the WRTA conducts maintenance and operations activities at 42 Quinsigamond Avenue in Worcester, a new facility opened in 2016.

Figure IV-4: WRTA Maintenance and Operations Facility, October 2016 (source: MassTransit)

Bus Shelters and Stops

The WRTA serves over 1,200 bus stops and nearly 40 bus shelters, most of which are located in Worcester. The WRTA employs a 'flag-stop' system throughout communities outside of Worcester. As shown in Figure IV-5, the majority of all shelters are WRTA-owned and maintained; the remainder are owned and maintained by public or private entities. CMMPO staff assists the WRTA as needed with:

- analyzing stop and/or shelter locations and passenger usage;
- responding to questions, concerns, or requests for stop/shelter installations/removals/relocations, and
- ensuring optimal stop/shelter design and placement as part of any transportation project.

Figure IV-5: WRTA Bus Shelter

Passenger Vehicles

The WRTA owns its own vehicles and contracts with Central Mass Transit Management, Inc. (CMTM) to manage its fleet of fifty-two full size (30', 35' and 40') fixed route buses and over fifty vans used to deliver paratransit service[2]. Seventeen of these buses are diesel-electric hybrids and twenty-nine are clean diesels. Shown in Figure IV-6, six of the full size buses are Proterra all-electric vehicles. As of February 2019, the fleet of full-size buses are collectively deployed on twenty-three fixed routes that operate in Worcester and twelve surrounding communities.

The present average age of the fixed-route fleet is approximately seven (7) years, with delivery of two new 35' buses pending in FY 2019.

[2] As of June 30, 2018

Figure IV-6: WRTA Proterra All-Electric Bus

The WRTA operates paratransit service through a number of subcontractors including Central Mass Transit Management, Inc. (CMTM); SCM Elderbus, and ten local Councils on Aging (CoAs). As shown in Figure IV-7, the WRTA owns 52 vans which are used to deliver paratransit services. Overall SGR responsibilities for these vehicles are assigned to CMTM, SCM Elderbus, and the CoAs accordingly. The average fleet age of WRTA paratransit vans, as of June 2018, is under four years. The average fleet ages compare favorably with FTA's five-year Useful Life Benchmark for these vehicles.

Figure IV-7: WRTA Paratransit Van

Source: Westborough Patch

Technology

WRTA Operations employs several technical tools for monitoring systems and vehicle performance, one of which is an Automatic Vehicle Maintenance (AVM) system. In addition, the WRTA owns and uses on-board technologies to monitor route and vehicle performance. For example, CMMPO staff monitors Automated Passenger Count (APC) data collected on WRTA fixed-route buses using WRTA's Ridecheck+ software and reports potential issues to WRTA Operations personnel for correction. Responsibilities for maintenance and upgrading of most WRTA-owned technologies are administered by the WRTA Administrator and Operations staff.

In 2017, the WRTA (in conjunction with fourteen other Massachusetts Regional Transit Authorities) contracted with Cambridge Systematics to develop TransAM, an asset inventory software program that allows each RTA to create asset inventories and set asset policy (Useful Life Benchmarks, replacement costs, and other parameters). The information that each RTA inputs into TransAM is shared with MassDOT's Rail and Transit Division for statewide coordination of RTA capital planning and asset management oversight responsibilities. TransAM became fully operational in 2018.

Analysis

The WRTA, in accordance with Federal requirements implemented in MAP-21 and the FAST Act, adopted a Transit Asset Management (TAM) Plan. This TAM Plan, effective through September 2023, will be updated annually to account for asset inventory, condition and operational changes. TAM Plan components include:

1) An Inventory of Assets Portfolio: an inventory of the number and type of capital assets to include: Rolling Stock, Facilities, and Equipment;

2) A Condition Assessment of Inventoried Assets: a condition assessment of those inventoried assets for which the WRTA has direct ownership and capital responsibility;

3) A Description of a Decision Support Tool: a description of the analytical process and decision support tool that the WRTA uses to assist in capital asset prioritization, and

4) A Prioritized List of Investments: the prioritized list of projects that the WRTA will use to manage or improve the State of Good Repair (SGR) of capital assets.

Average Fleet Age

An SGR measure is a transit fleet's average age. As shown in Table IV-7, the WRTA's Asset Management Plan (2018) uses the following FTA recommended Useful Life Benchmarks (ULBs) for its transit fleet:

Table IV-7: FTA Recommended Useful Life Benchmarks (ULBs)

Category	Length	Minimum Life (Whichever comes first)	
		Years	Miles
Heavy-Duty Large Bus	35 to 45 ft.	12	500,000
Heavy-Duty Small Bus	30 ft.	10	350,000
Medium-Duty Transit Bus	30 ft.	7	200,000
Light-Duty Mid-Sized Bus	25 to 35 ft.	5	150,000
Light Duty Small Bus, Cutaways and Modified	16 to 28 ft.	4	100,000

The WRTA system continues to benefit from an ongoing capital investment program that includes vehicle procurements. The current fleet average age is approximately seven years.

Fixed Facility Conditions

As part of its TAM Plan, the WRTA utilized an FTA-recommended asset rating scale with numeric values for assessing facility physical and/or functional condition. The rating scale is based upon numbers 5.0 – 1.0, with 5.0 being new and 1.0 being poor. Assets with a rating of 3.0 or higher are considered to be in SGR. Table IV-8 is shown as follows:

Table IV-8: FTA Asset Rating Scale

Condition	Ratings	Description
Excellent	5.0 to 4.8	New asset; no visible defects
Good	4.7 to 4.0	Asset showing minimal signs of wear; some (slightly) defective or deteriorated component(s)
Adequate	3.9 to 3.0	Asset has reached its mid-life (condition 3.5); some moderately defective or deteriorated component(s)
Marginal	2.9 to 2.0	Asset reaching or just past the end of its useful life; increasing number of defective or deteriorated component(s) and increasing maintenance needs
Poor	1.9 to 1.0	Asset is past its useful life and is in need of immediate repair or replacement; may have critically damaged component(s)

In accordance with the WRTA Asset Management Plan (2018):

a) **WRTA Hub at Union Station (2013):** The Hub was ranked in very good overall condition (4.7), an achievement considering the necessity of frequent repairs caused by heavy wear

on passenger area finishes/seating, repeated public restroom vandalism, and premature ancillary equipment failures.

b) **Maintenance and Operations ('M&O') Facility***:* The new M&O Facility at 42 Quinsigamond Avenue in Worcester (2016), maintained by the WRTA's Operations staff, is closer to Union Station than its prior M&O Facility at 287 Grove Street in Worcester. This decreases deadhead travel time for more efficient operations. Its condition, including principal equipment, achieved a 4.8 score in fall 2018.

c) **Bus Shelters and Stops***:* The WRTA inspects shelters on a monthly basis and pursues repairs, removals, and relocations on those it has control over as promptly as possible. Its contractor cleans the shelters several times a week. Bus stops are inspected less frequently but riders, drivers and inspectors communicate repair needs on an ongoing basis. In addition, the CMMPO staff periodically updates the WRTA's inventory, assesses stop safety and functionality, and works with WRTA Administrative and Operations staff on technical aspects of potential new stops, relocations, or eliminations.

While some new stops have been added to the system as new developments are completed (such as Lakeway Commons in Shrewsbury), others have been removed from some locations. These removals are frequently the result of resident or business owner complaints involving illicit activities, repeated vandalism, or progressive deterioration. These shelters are typically owned by entities other than the WRTA.

The WRTA, in concert with the WRTA Riders' Advisory Committee, is as of 2019 developing a pilot 'Adopt-a-Stop' program. This program's purpose is to ensure that stops (and shelters, if so equipped) are cleared of snow as required; can be kept clean and safe, and can generate long-term community stewardship.

The WRTA's bus shelters do not meet the minimum FTA asset value criteria for inclusion in the TAM Plan, but are included here for informational purposes.

Future Needs

The WRTA's long-term priority in the context of Mobility2040 is to maintain SGR by continued facility maintenance and the programming of Federal and State funds for facility projects as well as vehicle and equipment replacements. The CMMPO will continue to program WRTA capital projects utilizing federal funds; its most significant near-term investment is to replace its oldest fixed-route buses and paratransit vans, followed by select service vehicle replacements. The CMMPO has programmed funding in its current FFYs 2019-2023 TIP and expects to continue programming funds for WRTA capital needs during TIP development each year.

The WRTA's suite of technology improvements were implemented in 2012-2013 and with modifications and maintenance, are expected to remain in use. The WRTA and CMRPC continuously monitor the development of new or upgraded technologies supporting SGR, and will procure or acquire these technologies as needed.

The WRTA is able to obtain adequate federal funding through apportionments and the FTA Section 5307 Program for capital needs, particularly for vehicle replacements. However, state – sourced capital funds often must be reallocated to preventative maintenance, to make up for limited state and local operating assistance. This practice has been reported in prior long-range plans and is expected to continue.

Transit SGR depends indirectly upon SGR activities associated with MassDOT and municipality-owned infrastructure assets. These improvements chiefly involve:

- Roadway maintenance, repaving and reconstruction;
- Traffic controls (signal timing and phasing adjustments, signage), and
- Pedestrian and bicyclist infrastructure connecting with transit

Transit SGR must include prioritization of roadway maintenance and improvements on roadway segments identified elsewhere in this Plan (as listed in the previous Safety & Security section).

Intelligent Transportation Systems (ITS)

Background

Intelligent Transportation Systems (ITS) technologies are an integral management tool for the Region's public transportation operations. As for transportation, ITS produces real-time information that aids both operators (in managing and deploying assets) and customers (in making travel decisions).

The roots of ITS development in Massachusetts data back to 2004, when the Executive Office of Transportation-Office of Transportation Planning (now MassDOT) led the effort to develop a Central Massachusetts Regional ITS Architecture. This effort was updated in 2010. CMRPC's role was to build local involvement and support for the effort.

During the 2011 Central Massachusetts Regional ITS Architecture Update, participants identified the following fixed route transit service ITS priorities for the CMMPO region:

- congestion management
- efficient service
- efficient use of existing infrastructure
- economic development
- safety and security
- communications infrastructure
- traveler information
- ITS data

Multi-function Program Areas were also developed as part of the ITS Architecture Implementation Plan relevant to transit. These Program Areas included:

- CAD/AVL (Computer Aided Dispatch/Automated Vehicle Locator) for Transit Vehicles – Currently being deployed by the Worcester Regional Transit Authority (WRTA).
- Traffic Signal Priority – A future initiative for reducing congestion delays for WRTA buses.
- Regional Fare Card – Deployed in spring 2012, this initiative provides an interoperable fare medium allowing riders to use the WRTA, MBTA and other participating RTAs.
- Electronic Toll Collection Integration for Parking – Future initiative for MassDOT, MBTA, and community parking facilities that have controlled access.
- Regional Fare Card Integration for Parking – Future initiative for MassDOT, MBTA, and community parking facilities that have controlled access.

The WRTA ITS systems as they have evolved from the genesis of ITS are CMMPO's priority in the context of this Plan. The WRTA utilizes a wide range of Intelligent Transportation Systems (ITS) technologies, many of which were implemented in 2013. These technologies include WRTA administrative tools to improve service management, and rider tools to obtain real-time trip planning and ride information. Specific tools include:

- Automated: Vehicle Locators (AVL), Vehicle Announcements (AVA), and Passenger Counting Systems (APC);
- Ridecheck+/Clever Devices fixed-route data sampling and analytical software;
- Online Customer Service Information and Feedback System;
- Vehicle Maintenance Management System;
- Web Interface for Operator and Customer Real-Time Information;
- HASTUS scheduling software;
- Telecommunications equipment upgrades;
- StrataGen Systems' ADEPT (paratransit reservations/scheduling);
- Mentor Ranger (paratransit vehicle GPS, vehicle location and communication), and
- V/DMS technologies (passenger information)

The WRTA, its operators, and CMMPO Transit staff are using ITS to:

- Monitor compliance with fixed route on-time performance according to schedules and timepoints;
- Monitor paratransit trip times, pick-up windows, arrivals and departures according to trip origins and destinations;
- Collecting data to aid in the development of operating standards for different operating periods of the day;
- Better anticipate and plan for maintenance activities and vehicle assignments, including rotations in and out of service;
- Improve communications between WRTA dispatchers, inspectors and operators, as well as local public works departments and local police departments, to minimize service disruptions due to external emergencies, inclement weather and/or construction projects.

ITS Highlight: Improved System Operations

Passengers expect that transit services will operate on-time, that is, in conformity with published schedules. The WRTA employs the following technologies to maintain and improve

bus operations, particularly to on-time performance and minimizing bus passenger boarding times:

- Contactless Fare Collection – Contactless fare collection technology, known locally as "Charlie Card" technology, allows passengers to use pre-paid "smartcards" that can be read by a bus fare box to pay a fare, reducing waiting times to board buses at stops.
- Automatic Vehicle Monitoring (AVM) – AVM measures, monitors, and reports the status of critical systems and components for every bus in the WRTA fleet, allowing the WRTA to meet increased ridership demands through greater operational efficiency.
- Transit Signal Priority (TSP) - provides bus service travel time extensions at signalized intersections using devices that communicate with each other. TSP can reduce bus travel times and open congested corridors for future transit service consideration.

ITS Highlight: Passenger Data Collection

Transit ridership data collection is essential for tracking service performance. To obtain extensive and accurate ridership data in a time and cost-effective manner, the WRTA implemented Automated Passenger Counting (APC) in 2013. APC permits the WRTA to:

- count passenger boardings and alightings from all buses at all stops on every route;
- sample individual trips and individual routes;
- generate ridership performance statistics for daily, weekly, monthly and yearly periods, and
- furnish passenger information for National Transit Database (NTD) reporting.

ITS Highlight: Passenger Information

The WRTA BusTracker system displays real-time information at the Hub and is available to consumers through their mobile devices. The MBTA in 2017 began displaying real-time Worcester-Framingham Line Commuter Rail information on electronic screens at Union Station. Additionally, WRTA information for the statewide RideMatch website is updated on a regular basis.

Analysis

ITS technologies have revolutionized WRTA transit operations. CMRPC is committed to assisting the WRTA with its work to fully utilize and update these tools when required. CMRPC also will be continuing to monitor and evaluate emerging transit technologies for potential adoption.

ITS for Prioritization of Infrastructure Projects with Fixed Bus Routes

Transit Signal Priority (TSP) is a potentially valuable ITS option for Central Massachusetts' urban core. First identified in the 2011 Worcester Regional Mobility Study, WRTA buses approaching a TSP-equipped signal can communicate with that signal to give the bus more signal 'green time'. The bus (and other vehicles in mixed traffic) can proceed along a TSP-enabled WRTA route with fewer stops and starts - saving energy, reducing bus component wear, and lowering emissions. TSP would generate the greatest benefits in the WRTA's most densely developed corridors – the same corridors in which much of the region's EJ populations live, and where the highest concentrations of businesses, essential services, and civic activities are located TSP has a longer planning horizon, but has been tested at a specific intersection in Worcester and can be expanded, pending funding availability.

Transit ITS Technology Advances and Potential Issues

The MBTA is developing a new fare media system ("AFC 2.0"), to replace its existing 'Charlie Card' fare collection system.

- tap and board at any door with a fare card, smartphone, or contactless credit card;
- reload their accounts using cash or a credit card at vending machines at all stations and some bus stops, and
- go online to manage their MBTA account 24/7.

AFC 2.0 is scheduled to begin testing in late 2019 with full deployment in 2020, and retirement of the CharlieCard in 2021. More information on the MBTA's AFC 2.0 is available from the MBTA.

Pros: CMMPO region MBTA riders will be able to use the new MBTA fare media on all MBTA modes including Commuter Rail. Its capabilities will eliminate the Commuter Rail current CharlieTicket and on-board fare payment. Pay on the platform; tap-in and tap-out will be used to correctly assess zone fares, and proof-of-payment will be conducted aboard vehicles. The new platform builds in flexibility to add unspecified features in the future.

Cons: the RTAs (including the WRTA) are advised that MBTA AFC 2.0 will not include the current CharlieCard/RTA interoperability enabled in 2012. It is unknown whether AFC 2.0 will allow customers to pay for parking or other associated MBTA fees in the future. Accordingly, existing MBTA/RTA fare interoperability will be eliminated for at least eighteen months following 2020 full deployment. RTAs are discussing next steps as of February 2019; retention/modification of existing Scheidt & Bachman farebox technologies coupled with new 'backroom' accounting will be required.

Needs

CMMPO will continue to work with the WRTA and its service providers to:

- Monitor existing ITS technology performance;
- Research and assist with new technology procurements, as needed;
- Identify and address ITS and related technology functionality issues, such as compatibility across RTA and MBTA Service Areas;
- Identify and plan for ITS implementation aiding development of Mobility as a Service (MaaS);
- Continue ITS implementation in the region's roadway network where transit operates, and
- In Worcester, continue to support the City's efforts to upgrade intersection signals and equip/enable Transit Signal Priority (TSP).

Access to Essential Services

Background

Transit access to essential services such as employment, education, health care, public services, access to food and recreational activities is a primary WRTA goal. The WRTA Service Standards (2012) state: "It shall be the policy of the WRTA to space routes such that within approximately 90% of the densely populated areas of the core city, Worcester, residents shall reside within one quarter (1/4) of a mile from a bus route." In order to accomplish this, the Service Standards include the guidelines for route design. The following factors are considered essential for route design: population density (4,000 persons per square mile), employment density (200 employees or more), route and corridor spacing, demographics, service equity, interline enhancement, route directness, proximity to trip generators and destinations, and intermodal connectivity.

The CMMPO prepares a Coordinated Public Transit-Human Services Transportation Plan (CPT-HST) that it updates every five years. CMMPO staff continues to work with MassDOT, the WRTA and many other transportation stakeholders including the Central Massachusetts Regional Coordinating Council (RCC) to implement CPT-HST Plan recommendations.

The WRTA Hub at Union Station facilitates intermodal connections to intercity bus (Peter Pan / Greyhound), intercity rail (Amtrak) and commuter rail (MBTA), expanding transit access within and outside the region. The WRTA Hub accommodates up to eight fixed-route buses at a time, providing modern accessibility and transfer capabilities for fixed-route and paratransit services.

The WRTA maintains access to essential services by conducting continuous and targeted engagement work in its Service Area. Staff engages the community, including riders, community groups, colleges and major employers to identify and address individuals' needs. Staff also prepares and distributes WRTA service information tailored to each group. Examples include:

- Route information for college students with key destinations;
- Combination schedules showing multiple routes for major employers;
- Employee address matching to provide personalized route information;
- Improved access to schedules and passes;
- Mapping of social service agencies in relation to the fixed route system;
- WRTA travel training for the general public;
- Employer or rider surveys to obtain information on needs.

Analysis

In 2014-15 the URS Corporation developed a WRTA Comprehensive Service Analysis (CSA). The CSA included a transit market analysis that compared regional socioeconomic data with population density, vehicle availability, land uses and locations of employment in the WRTA Service Area. The CSA also contained a route-by-route analysis and recommendations for service improvements.

URS concluded that overall WRTA services in operation at that time were well designed to accommodate the transit needs of the region's workforce. URS also identified sub-areas within the WRTA Service Area for potential service improvements, particularly to access employment. Finally, URS recommended implementing late night service and expanded weekend service to better match current employment trends.

Key CSA service recommendations:

- Eliminate specific low-performing fixed routes or route segments and reallocation of operating funds to those routes which were more productive;
- Develop improved fixed route operations on Main Street (Worcester);
- Extend spans of service and increase service frequencies to create a "clock face schedule"- particularly on weekends;
- Establish fixed-route service along Park Avenue (Worcester);
- Establish "cross-town" fixed routes to serve east-west travel within Worcester, and
- Create routes providing more direct service between specific origins and destinations.

URS determined that the WRTA provided fixed-route service to all but five Service Area locations indicating current or future high transit demand. These five areas were located in the towns of Barre, Douglas, Dudley, Holden, and West Brookfield. Each area contained clusters of current or future employment activity, service agencies and schools. Several of these towns had higher than average percentages of: 1) households without a vehicle; 2) low income populations, and 3) elderly populations.

The WRTA and/or other organizations subsequently implemented certain CSA-recommended services, including:

- Quaboag Connector: the Quaboag Valley Community Development Corporation began operating a new transit service in 2017 linking many of the communities in which mobility needs had been identified in the CMRPC *Rural 11 Prioritization Project* study, The Connector also opened up the opportunity for a transit connection between the

Pioneer Valley Transit Authority (PVTA) and the WRTA. The Central Massachusetts Regional Coordinating Council (RCC)'s planning supported this new service, and

- WRTA Route 10: this route was implemented in 2015 following discussions between the WRTA and the Higher Education Consortium of Central Massachusetts (HECCMA), a consortium of ten colleges in the WRTA Service Area. Its purpose was to improve transit access among several HECCMA member institutions. After two years of operation, the service was eliminated following a loss of financial support from the effected colleges and low ridership.

Needs

The region's mobility needs have changed dramatically since the CSA was completed. After 2015, the WRTA was compelled to maintain service with lower than expected State operating funds, increased costs, and lower ridership. The advent of Transportation Network Companies (TNCs), an improved economy, and rising household access to automobiles – have contributed to low or no demand for some of the services recommended in the CSA. To date, the WRTA has maintained access to essential services while reducing or eliminating some unproductive services – and was able to implement some CSA service recommendations. The WRTA and CMMPO, mindful of key CSA recommendations, will continue to monitor demand and feasibility for:

<u>System Core</u>

- Increasing the number of routes operating on weekends;
- Improving schedules for routes which operate on weekends along mainline corridors;
- Implementing new "cross-town" services beyond current bus pairings and outside existing routes' "hub-and-spoke" alignments.

<u>System Periphery</u>

- Implementing transit in a new corridor at the southernmost part of the region connecting the towns of Dudley, Southbridge, Sturbridge and Webster. Local residents and officials continue to advocate for such a service at WRTA public meetings and other transportation and community development events.

Next Steps and Prioritization

The travel demand model will be used to analyze recommendations from the CSA. New bus routes, existing route expansions and route changes are coded into the model to understand the new ridership and the travel behavior of the commuters. The results of the model will be used to prioritize the implementation of the recommendations. Funding availability will play a major role in the timeframe for implementation.

Intercity Bus

Background

The CMMPO region is generally well connected to most major Northeast cities by combined Greyhound and Peter Pan services. Service frequencies vary, from hourly service to Boston to two daily roundtrips to Providence.

Analysis

The Commonwealth has long been involved in supporting intercity bus transportation. MassDOT's Rail and Transit Division created the BusPlus+ Program in 2013. BusPlus+ was able to make a difference in some areas lacking intercity coverage, frequency, or connectivity when operators made these commitments as part of their service agreements for new buses. The operators were responsible for all maintenance and operating costs. Peter Pan and Greyhound, as recipients of BusPlus+ funding, expanded services to increase commuter trips from Sturbridge to Boston in early 2014 and Worcester to Boston in September 2014. The Program was referenced in MassDOT's Regional Bus Network Assessment (KBB, 2016) but appears to be inactive at this time.

Significant bus passenger volume growth occurred in the Northeast in the last three years, much of which is attributed to the termination of the Pool Agreement between Greyhound and Peter Pan in September 2017. This Agreement allowed the carriers to coordinate schedules and share revenues with antitrust immunity.

The "upside" of the Pool Agreement was that it allowed passengers to freely switch between departures with minimal hassle – conveniences that permitted the carriers to compete more effectively with Amtrak and airlines. By having coordinated schedules, passengers enjoyed service at regular intervals – often hourly – in major corridors, putting the bus on a more even footing with airline "shuttles" and Metroliner trains. Increasingly, however, the "downsides" of pooling - complex administration, e-ticketing difficulties and providing guaranteed seating to all ticketed passengers – proved extreme. Such seat guarantees, which eliminate the need to arrive at the station early to secure a place in line, have become universal on express coach lines such as BoltBus and Megabus. With the Pool's elimination, Greyhound and Peter Pan are once again head-to-head competitors. Each has rolled out e-ticketing, and Greyhound has added significant capacity on most major Northeast Corridor routes, including New York to Boston and Washington. The historic carrier also launched an entirely new route linking Boston to Washington via Hartford and the George Washington Bridge Station in northern Manhattan.

Despite going their separate ways, however, both carriers continue to share space in most of the terminals previously used for Pool service.[3]

Particular to the CMMPO region, the cancellation of the Greyhound-Peter Pan Pool Agreement (2006-2017) is perhaps the most significant event to intercity bus operations in the CMMPO region since Mobility2040 was written.

Future Needs

Participate in MassDOT initiatives to coordinate intercity bus services that operate and/or deliver service in the CMMPO region.

[3] https://las.depaul.edu/centers-and-institutes/chaddick-institute-for-metropolitan-development/research-and-publications/Documents/2018%20Intercity%20Bus%20Outlook.pdf, p.1.

Commuter and Intercity Rail

Background

In the CMMPO region, commuter rail services operated by the Massachusetts Bay Transportation Authority (MBTA) are the predominant form of passenger rail service used by the region's residents, followed by intercity rail services operated by Amtrak.

MBTA

The MBTA (Figure IV-8) owns a forty-four mile segment of the former Boston and Albany Railroad ('B&A') Main Line. This segment forms the MBTA Framingham-Worcester Line between Boston's South Station and Worcester's Union Station. Three of the Framingham-Worcester Line's passenger stops (Grafton, Westborough, and Worcester) are located in the CMMPO region; Worcester's Union Station is the terminus of the Line and is also the region's principal passenger rail activity hub. Keolis Commuter Services, the MBTA's Commuter Rail system operator, has operated the Framingham-Worcester Line since 2013 and will continue to do so through June 2022.

Figure IV-8: MBTA Commuter Rail

Source: Jonathan Wiggs/Boston Globe Staff

Amtrak

Similar to other passenger railroad systems, Amtrak receives public funding for capital costs and operating expenses. The sole Amtrak service operating in Central Massachusetts is the *Lake Shore Limited* (Figure IV-9), which operates between Boston and Chicago, directly serving Cleveland, Buffalo, Albany, Springfield, Worcester, and Pittsfield among other cities. Amtrak operates on the former B&A Main Line – including the segment cited above that is now owned

by the MBTA, and the CSX-owned segment from Worcester Union Station west into the state of New York.

Figure IV-9: Amtrak Lake Shore Limited

Source: http://allaboardohio.org/wp-content/uploads/2015/10/Lake-Shore-ClydeNY-Dec2010-MattDonnelly1-rev.jpg

State of Good Repair (SGR)

The MBTA shoulders most of the responsibility for SGR monitoring, maintenance and improvements, and reporting associated with the region's passenger rail assets. The Worcester Redevelopment Authority (WRA), as owner of Worcester's Union Station, is responsible for SGR activities associated with that facility; some regional SGR responsibilities are assumed by Amtrak.

Following CSX's transfer of ownership and control of the right-of-way used for the Framingham-Worcester Line to the MBTA, the MBTA initiated a multi-year Framingham-Worcester Line improvement program that continues to the present. Core SGR activities consisted of track de-stressing, drainage and grading work as well as vegetation maintenance – to reduce potential for fouled tracks and drainage impediments. This work has benefited the MBTA, Amtrak, and CSX freight operations.

All train operations on the Framingham-Worcester Line have been affected by speed restrictions when necessitated by high temperatures. The MBTA has taken action to minimize the need for such restrictions; it implemented a track de-stressing project between Worcester and Grafton in 2014-2017. The MBTA reports that this project reduced Line delays from 5,000 minutes (summer, 2015) to 17 minutes (summer, 2018). This project, in combination with other improvements, has helped increase MBTA on-time performance - from 66 percent in 2007 to nearly 88 percent through September 2018.

Positive Train Control (PTC) implementation, which began in June 2018, is a current activity which will improve the Line's performance and safety as well. Work began in June 2018.

For discussion of passenger rail SGR on the CSX-owned right-of-way west of Worcester Union Station, passenger rail studies underway may yield information on existing or future SGR activities in that segment.

As of 2019, the WRA is undertaking substantial SGR work at Worcester's Union Station. Work includes: materials abatement, masonry repairs, waterproofing, and tenant space fit-outs constitute current discrete non-routine projects, in addition to routine building and grounds maintenance.

Analysis

Productivity

Amtrak Lake Shore Limited: The 1,017-mile *Lake Shore Limited* Boston-Chicago route operates daily to/through twenty-six cities in six states. It serves Worcester's Union Station twice a day, once at midday for Boston-Chicago westbound service, and once in the evening for Chicago-Boston eastbound service. The *Lake Shore Limited* served 388,722 passengers in FY17, and 387,900 in FY16, up from 356,900 passengers in FY15. Overall ridership since 2011 has been relatively stable, peaking at 403,700 passengers in FY12. Worcester's Union Station boardings/alightings totaled 7,237, 6,152 and 6,665 in FYs 15-17, respectively – lowest of all Massachusetts stations above only Framingham. Boston's South Station, Springfield, Back Bay and Pittsfield generate greater passenger activity.

MBTA Framingham-Worcester Line: in FY2013, the Framingham-Worcester Line ranked second of fourteen MBTA Commuter Rail Lines, with 16,293 total (inbound and outbound) daily boardings. Weekday daily passenger activity at Worcester's Union Station, measured in inbound boardings (1,475) ranked eighth of 133 MBTA Commuter Rail stations. In FY2013, between Worcester, Grafton (724), and Westborough (759), the Central Massachusetts stations represented about 27% of a typical weekday for inbound boardings on the Framingham-Worcester commuter rail line (11,044)[4]. Subsequent MBTA 2012-2018 Commuter Rail statistics released in late January 2019: show that the Framingham-Worcester Line:

- remains the second busiest route in MBTA Commuter Rail System;
- increased ridership from 12,787 daily boardings (2012) to 18,636 (2018), a change of 46%, and
- placed first among all Lines in growth of number of riders and second in percentage of growth.

[4] MBTA, Ridership and Service Statistics: July 2014, http://www.mbta.com/uploadedfiles/documents/2014%20BLUEBOOK%2014th%20Edition.pdf

Service Improvements

Transportation stakeholders have voiced several longstanding MBTA commuter rail service issues in Central Massachusetts, from limited reverse commuting opportunities to poor on-time performance. Activity highlights:

- 2014: Worcester-Boston round trips increased to twenty on weekdays and nine on weekends. Schedule modifications added peak period service and opportunities for Boston-Worcester reverse commuting;
- May 2016: the MBTA's 'Heart to Hub' branded service added one daily nonstop train between Worcester and Boston;
- September 2016: a newly-formed Worcester Line Working Group began discussions on improvements for better passenger/freight train coordination, right-of-way upgrades, and improved on-time performance;
- 2018: MBTA/Keolis implemented a $10 weekend commuter rail pass program to boost system ridership, and
- 2018: in response to passenger requests, nine additional Framingham/Worcester Line trains make flag stops or early departure stops at the Boston Landing station.

The MBTA attributed ridership increases between 2012-2018 cited above to the addition of four AM peak trains and two PM peak outbound and two late evening trains in that period.

Current Service Reliability Issues:

- System capacity resiliency. Presently, line service frequencies are maximized. The AM peak schedule (5:15 AM to 9:00 AM) cannot accommodate another train with existing infrastructure. Delays incurred by one train can quickly cascade to every other following train.[5]

Potential Service Reliability Issues:

- Managing delays associated with maintenance and improvement projects. The near-term Line project is implementation of Positive Train Control (PTC) (Figure IV-10). The MBTA announced in January 2019 that its revised schedule for system-wide implementation by December 2020 was approved by the Federal Railroad Administration. PTC is installed and has been tested on some Lines; PTC technology and testing on the Framingham-Worcester Line is scheduled for FYs 19-20. On-time performance will likely be impacted as track and wayside work is performed.

[5] https://framwormbta.weebly.com/blog/category/new-schedule

Figure IV-10: Coordination of MBTA Commuter Rail Operations with PTC Implementation

Source: https://www.mbta.com/news/2019-01-07/fra-approves-mbta-positive-train-control-program-extension-2020

- Outage of the second main track at Allston to accommodate early construction of a new station serving Harvard University's Allston Landing could impact the entire Line's performance. MassDOT, the MBTA and local advocates are debating when construction will occur; some want it constructed within the next ten years, not after 2040 as was initially proposed.

Future Needs

Most passenger rail future needs will involve improvement or expansion of services now operated by Amtrak and the MBTA.

While the CMMPO does not program funding for MBTA Commuter Rail or Amtrak operations, it programs Federal Transit Administration funds awarded to the WRTA for ongoing support of Worcester's Union Station. However, CMMPO's Transportation staff identifies future passenger rail needs through active involvement in passenger rail policy development, ongoing service monitoring, and coordination of WRTA services with MBTA Commuter Rail schedules to ensure that passengers can make connections between Commuter Rail and local transit.

A series of Future Needs have been discussed among participants in initiatives such as the Framingham-Worcester Line Working Group and in the context of various plans such as the MassDOT State Rail Plan (2018). Highlights of specific issues for existing passenger rail operations in the CMMPO region are as follows:

General signal system upgrades

Advocates cite the following Framingham-Worcester Line block signal system constraints that decrease headways and reduce line capacity:

- Approximately ten minutes is required to clear individual train departures from South Station, and
- A minimum of twelve minutes must be allowed between trains arriving at Framingham.

Facility Locations, Layouts, and Controls

- Several long-term operational upgrades are suggested for the immediate area around Worcester Union Station. Currently, a minimum of thirty minutes must be allowed between trains arriving at Worcester. The existing Union Station single passenger platform, track ownership and dispatching activities west of Union Station, and the location of the MBTA train storage yard east of the station requires trainsets to reverse direction and move towards Boston then reverse direction a second time and move into the storage yard. These movements block other trains from access to Union Station. The switch and track configuration in this area does not allow for parallel train movements or train movements around the storage track approach.
- To address some of the Worcester-specific issues cited above and to accommodate a potential Springfield-Boston passenger service, the MBTA and the City of Worcester in 2017 committed to fund conceptual design of a new 850' long, $30 million passenger platform. Design and engineering work was initiated in winter 2018; the work scope includes reconstruction of the existing Union Station platform along the Station's south façade (used by Amtrak/MBTA); restoring and reopening existing stairways in the passage between Union Station and its Parking Garage, and potentially installing an elevator. The Project is being coordinated with structural and water infiltration repairs required on the south and west sides of the Station. The MBTA projects that design, bidding, and construction activities will extend through fall 2022.

Other MBTA Framingham-Worcester Line Improvements that have been discussed by the Worcester Line Working Group or as part of MassDOT's Rail Vision Study (2018-2019):

- upgrading Line or Line segment speed limits;
- installing a passing track between Boston and Framingham to allow express and local trains traveling in the same direction to pass one another (presently infeasible);
- electrification – allowing for quicker acceleration and deceleration to reduce trip times;
- upgrading all stations to full high-level platforms – to reduce station dwell times for

passenger boardings (Yawkey, South Station and Boston Landing are the only three stations so equipped today). Advocates have suggested prioritizing construction of full high-level platforms according to ridership activity, due to the high cost.[6]

- realigning the Massachusetts Turnpike and rebuild a deteriorating, elevated stretch of the Turnpike adjacent to Boston University before constructing the future 'West Station'.

In a departure from prior CMMPO plans, this Mobility2040 Update involves discussion of one or more future passenger rail services beyond service currently operated by Amtrak or the MBTA, as follows:

Other Potential Needs:

- Connections between Regional Transit Authorities at suburban MBTA Commuter Rail stations. Such connections generally are non-existent; if created, inter-modal and inter-regional travel could benefit. For example, the WRTA could work with the MetroWest Regional Transit Authority (MWRTA) to connect at an MBTA Framingham-Worcester Line station, i.e. either Westborough or Southborough, in the future.
- MBTA station parking capacity expansions. The Town of Westborough has been working independently and with the MBTA to develop additional parking adjacent to the existing 448-space Westborough Station. Parking demand routinely exceeds 100% at this facility.

Proposed Providence-Worcester-NH Passenger Rail Service

In addition to MBTA Commuter Rail improvement proposals, the Boston Surface Railroad Company (BSRC) in 2014 initiated a passenger rail service feasibility study for an existing rail corridor then owned and operated by the former Providence and Worcester Railroad (PWRR). The feasibility study, released in August 2015, proposed three weekday daily round trips between Providence and Worcester with one midline stop in Woonsocket, RI – an estimated 70-minute trip. BSRC reported that the US Surface Transportation Board (STB) granted it approval to operate this proposed service in 2016. Notably, also in 2016, the BSRC advised that it was able to continue development of its Providence-Worcester service proposal with the Genesee and Wyoming Railroad (GWRR), which acquired the PWRR in 2016. Following STB approval, BSRC proposed a second phase of passenger rail service that, if implemented, would extend the Providence-Worcester service to Lowell, MA and Nashua, NH.

BSRC has advised of the following activities:

[6] (Dave Perry's Fham/Worc Com Rail Blog
https://framwormbta.weebly.com/blog/category/new-schedule

- negotiations with MassDOT for rights to operate passenger rail service between Worcester and Lowell;
- formation of an agreement with the City of Nashua, NH to develop and operate commuter rail service between Nashua, Lowell and Boston (*note that prior City efforts to establish a similar service failed to obtain NH officials' support);*
- BSRC's purchase of locomotives and rolling stock from CTDOT and other parties, and commencement of reconditioning work on this equipment;
- development/integration of Positive Train Control (PTC) capacity, a G&W requirement, and
- agreements with the Cities of Woonsocket, Worcester, and Lowell (in addition to Nashua) and endorsements from Congressional representatives to secure support for future Federal Transit Administration (FTA) funds. BSRC projects a desired $200 million investment over a ten-year period.

To operate this service, BSRC will also have to integrate its passenger operations with existing Providence-Worcester (GWRR) and North Worcester-Lowell-Nashua (PanAm Railways, or PAR) freight operations.

Northern New England 'High-Speed Passenger Rail'

In 2015 CTDOT, MassDOT and the Vermont Agency of Transportation (VTrans), with the assistance of the Federal Railroad Administration, partnered as the Northern New England Intercity Rail Initiative ('NNEIRI') for the purpose of studying the feasibility of three passenger rail improvement projects. Particular to the CMMPO region, the Partnership analyzed the feasibility of creating an "Inland Route" between New Haven and Boston via Hartford, Springfield, and Worcester as well as establishing Boston-Montreal passenger rail service. The study, completed in June 2016, recommended two services that would directly serve the CMMPO region:

- Boston-Montreal: one daily round-trip with stops at all existing stations between Boston, Springfield, and Montreal. Train schedules would be coordinated with other intercity trains to provide adequate spacing and coordination of service, offering an 8-hour, 10-minute one-way travel time, and
- Boston-New Haven: eight daily departures with trains stopping at all existing stations along the Inland Route, offering a 3-hour, 40-minute one-way trip .

Ridership estimates for a Boston-Montreal service were estimated at approximately 103,000 riders per year, and approximately 429,000 riders per year for a Boston-New Haven service.

Upgrades to existing rights-of-way for higher-speed standards suitable for Amtrak operations would be required in some locations. In the CMMPO region, a principal consideration would be the restoration of the second Springfield to Worcester track within the CSX-owned right-of-way.

Two tasks identified in the Study are underway as of 2019: 1) Worcester Union Station platform upgrades, and 2) the East-West Passenger Rail Study (see below).

Project cost and offsets are estimated in Table IV-9 as follows:

Table IV-9: NNEIRI Projected Capital, Operations Costs and Offsets

Cost or Offset by Type	Inland Route (New Haven-Boston)	Boston-Montreal
Capital	$554,000,000 - $660,000,000	$591,000,000 - $634,000,000
Operations (annual)	$33,000,000	$23,000,000
Revenue/Subsidy:	$33,000,000	$11,000,000

Source: NNEIRI

East-West Passenger Rail Study

To advance some of the work conducted in the 2015-2016 NNEIRI study, MassDOT engaged a consultant team in mid-2018 to study the feasibility of east-west passenger rail service to/from Boston, with potential connections along the former Boston and Albany Railroad ('B&A') Main Line to Palmer, Pittsfield and Springfield through Worcester. In conjunction with the Study, an East-West Passenger Rail Study Working Group was formed with members representing a wide array of interested parties along the corridor between Pittsfield and Boston.

The consultant team will develop several infrastructure and service options with consideration for service goals, technical constraints and opportunities, and projected ridership and other benefits.

Auto Travel

Congestion

Background

The Congestion Management System (CMS) was first introduced by the **Intermodal Surface Transportation Efficiency Act** (ISTEA) of 1991 and continued under the successor law, the **Transportation Equity Act for the 21st Century** (TEA-21). The CMS was intended to augment and support effective decision making as part of the overall metropolitan planning process. In 2006, the **Safe, Accountable, Flexible, Efficient Transportation Equity Act**: A Legacy for Users (SAFETEA-LU) called for the CMS to be evolved into a Congestion Management Process (CMP), with a greater focus on implementation of operational improvements to the highway system to mitigate congestion. In 2012, the **Moving Ahead for Progress in the 21st Century Act** (MAP-21) called for the continuation of the CMP program while also requiring a transition to performance based planning, reaffirmed by 2015's successor national legislation **Fixing America's Surface Transportation** (FAST) **Act**.

A technical team comprised of staff from MassDOT predecessor agencies, the MPOs, the MBTA, other RTAs and a prior ride share contractor cooperatively developed the Massachusetts Congestion Management Process, or CMP (previously called Congestion Management "System"). It was charged with the responsibility for the overall design of the Commonwealth's CMP as well as the development and evaluation of various strategies or improvement options. It also selected standard performance measures and congestion monitoring techniques to be used statewide. Although considered a statewide system, the CMMPO staff has been responsible for both developing and maintaining the planning region's CMP within the flexible framework originally established by the technical team.

Congestion management is the application of strategies to improve transportation system performance and reliability by reducing the adverse impacts of congestion on the movement of people and goods. A CMP is a systematic and regionally-accepted approach for managing congestion that provides accurate, up to date information on transportation system performance and assesses alternative strategies for congestion management that meet both state and local needs. The CMP is intended to move these congestion management strategies into the funding and implementation stages.

The CMP, as defined in federal regulation, is intended to serve as a systematic process that provides for safe and effective integrated management and operation of the multimodal transportation system. The process includes:

- Development of congestion management objectives
- Establishment of measures of multimodal transportation system performance
- Collection of data and system performance monitoring to define the extent and duration of congestion and determine the causes of congestion
- Identification of congestion management strategies
- Implementation activities, including identification of an implementation schedule and possible funding sources for each strategy
- Evaluation of the effectiveness of implemented strategies

The CMMPO staff conducts the preparatory work and scheduling needed to collect all pertinent data necessary to maintain the region's ongoing CMP program. Travel Time and Delay studies are conducted on identified CMP focus roadway segments, defined either analytically or through the public outreach process. A limited number of roadways where congestion is projected to occur as well as select monitoring locations are also included in this activity. Through observations made in the field, the presence of congested conditions is either confirmed or disproved.

Data needed to analyze the operations of the critical intersections identified along the focus roadway segments is also collected through the CMP effort. Peak period Turning Movement Counts (TMCs) and physical inventories are conducted at the critical intersections in the planning region. During the counts, bicycle and pedestrian activity are also recorded at TMC locations.

MassDOT maintains multiple Park and Ride facilities within the CMMPO region. The CMMPO staff conducts utilization studies every one or two years to measure the usage at these lots. Further, staff considers potential bottlenecks on the region's roadways. Usually one bottleneck location is studied each year. Additionally, on-time performance is studied for the WRTA's fixed-route buses to determine which routes are continually running late. Traffic volume data and heavy vehicle percentages are also analyzed along federal-aid roadways. Lastly, safety data is analyzed to determine the top vehicle crash locations in the region. These top crash locations contribute to congestion due to a relatively high frequency of crashes.

Performance Management

As discussed in Chapter II of this report, federal laws require performance based planning that supports its planning emphasis areas, one of which is congestion. Besides the federal performance measures, the CMMPO also have a number of regional goals and measures that are followed. In this section, Goal 1 is related to FHWA Rule PM3 while Goals 2 and 3 are regional goals. The measures and targets for these goals are as follows:

Goal 1 – Achieve a significant reduction in congestion on the National Highway System (PM3)

- A level of travel time reliability (LOTTR) on both Interstate and non-Interstate NHS that includes a ratio below 1.50 for all recorded time periods.
- A level of truck time reliability (TTTR) on Interstate NHS that includes a ratio below 1.85 for all recorded time periods.
- The target for Peak Hour Excessive Delay (PHED) per capita for the MA-NH and Worcester urbanized areas (UZA) is 18.31.
- Maintain a percentage of Non-Single Occupancy Vehicle Travel (SOV) below 35.46%.
- Emissions reductions of 1,622 CO and 497.9 Ozone.

Goal 2 – Reduce travel delay through Intelligent Transportation Systems (ITS)

- Install ITS for each Highway and Transit TIP.

Goal 3 – Manage congestion with increases in population

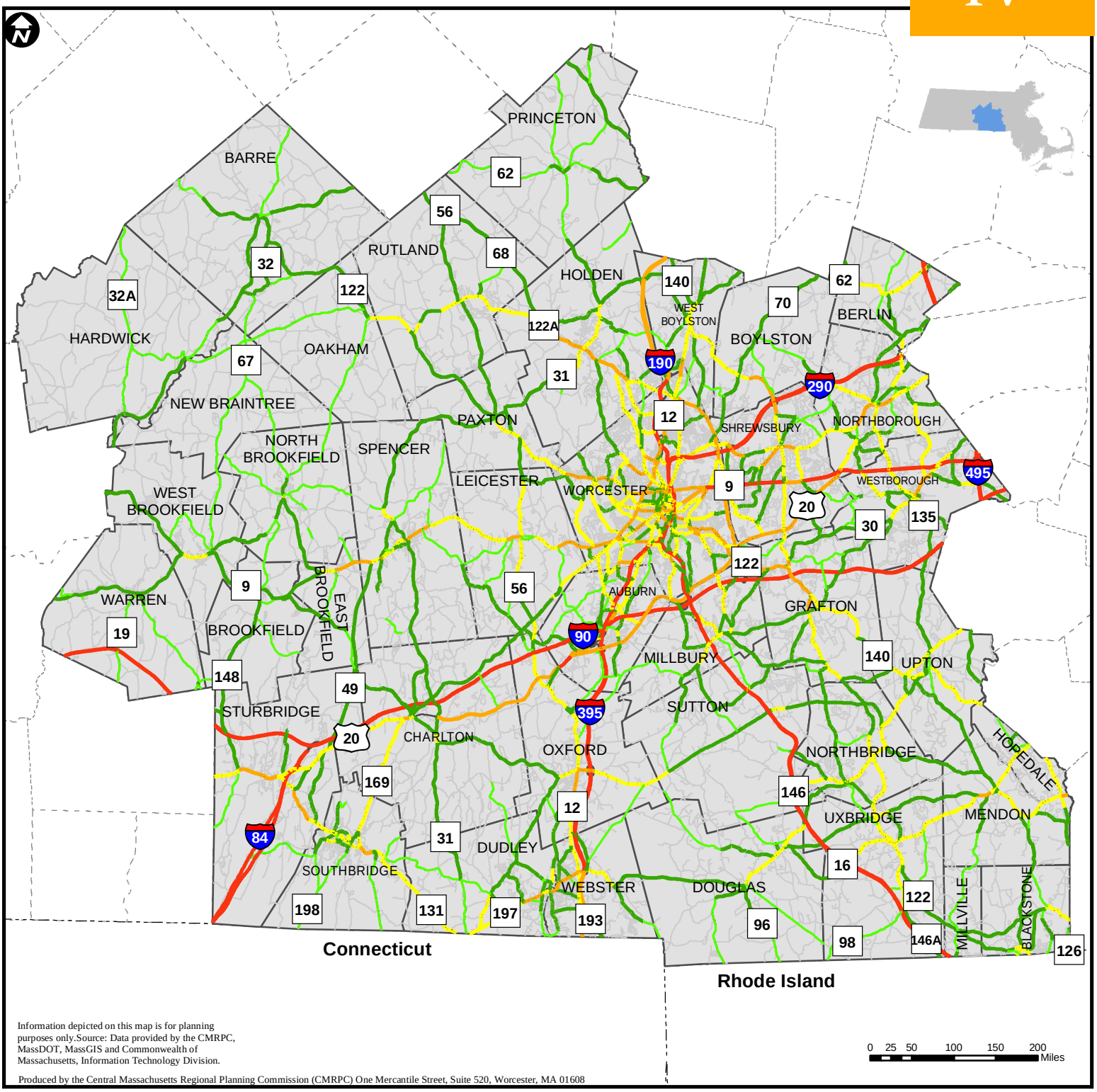
- Maintain the number of congested miles per capita below the established trendline.

Analysis

Since 2015, CMMPO staff has completed over 20 Travel Time and Delay studies, analyzed over 100 intersections, monitored five Park-and-Ride lots, conducted over 500 traffic counts, and studied four identified local "Bottleneck" roadway segments. The analyses of all these data collection activities are compiled and included in yearly CMP progress reports. The most recent progress reports can be found at http://www.cmrpc.org/congestion-management-process.

Traffic Volumes

As shown in Figure IV-11, the highest traffic volumes are on the Interstate highways, especially Interstates 90, 290, and 495. Daily volumes exceed 115,000 vehicles on sections of Interstate 290 in Worcester. Also, over 90,000 vehicles a day use Interstate 90 between Sturbridge and Hopkinton. MA Routes 9, 20, and 146 are lower volume roadways, but still carry between 20,000 and 40,000 vehicles a day on some sections in the urban towns. Rural towns in the western part of the CMMPO region have very few roadways with over



Information depicted on this map is for planning purposes only.Source: Data provided by the CMRPC, MassDOT, MassGIS and Commonwealth of Massachusetts, Information Technology Division.

Produced by the Central Massachusetts Regional Planning Commission (CMRPC) One Mercantile Street, Suite 520, Worcester, MA 01608

CMMPO

CENTRAL MASSACHUSETTS Regional Planning Commission

Figure IV-11 Average Daily Traffic Volume

Traffic Volumes

- < 2,500
- 2,500 - 7,499
- 7,499 - 14,999
- 14,999 - 30,000
- > 30,000
- CMRPCTowns

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10,000 vehicles a day. For additional traffic volumes see CMMPO staff's Daily Traffic Volume report or visit the MassDOT Transportation Data Management System website.

Travel Time Data

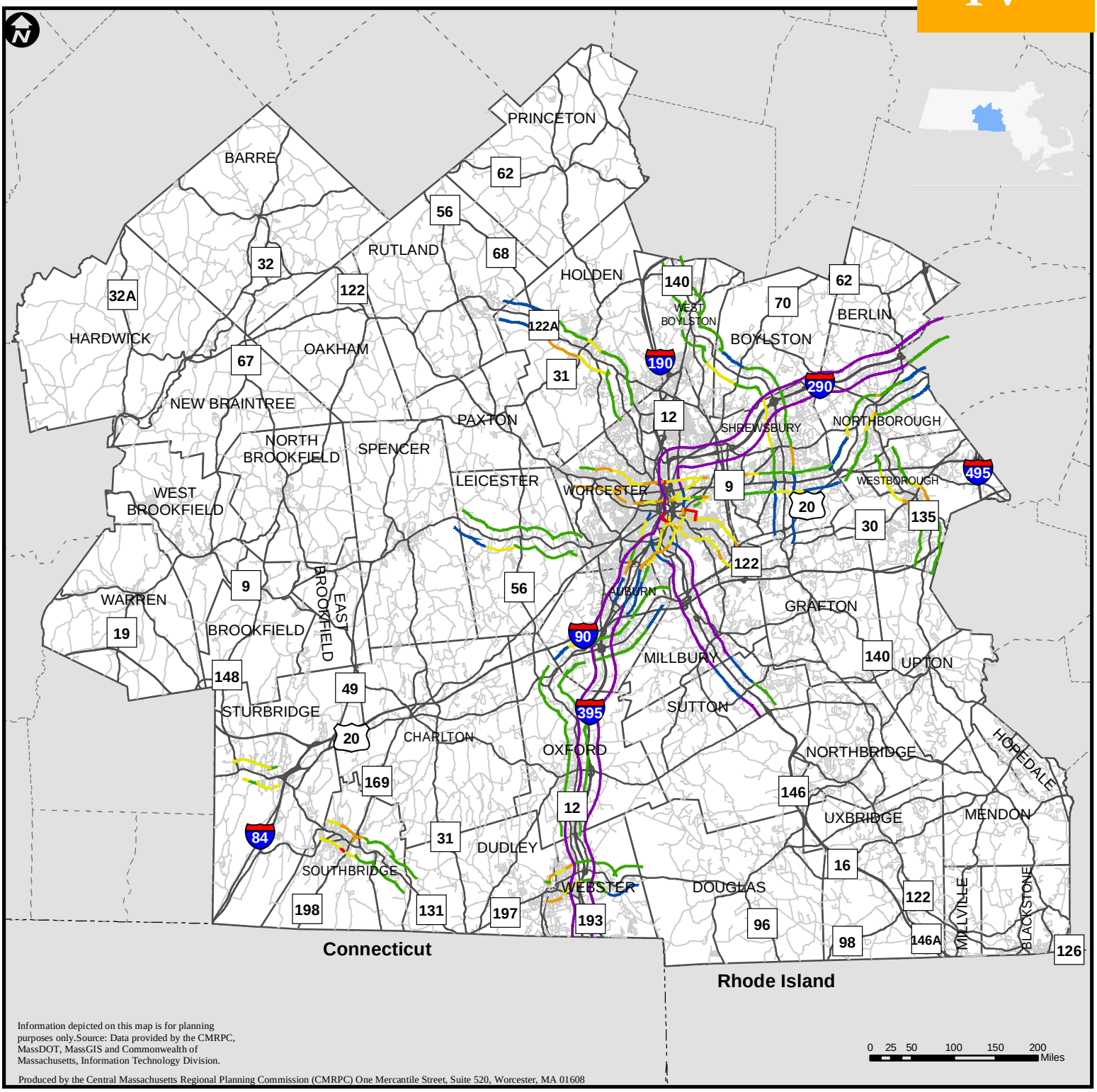
The CMMPO staff used its Travel Demand Model to identify a number of roadway segments throughout the region that are or projected to be congested by 2040. In order to measure congestion on the region's highway facilities, travel time and delay studies have been conducted on identified CMP focus roadway segments. Data is collected between 7am and 9am and from 4pm to 6pm on a single randomly-selected weekday. In addition to determining average travel speeds, these studies assist in the identification of critical delay locations as well as the length of encountered delays. Predictably, slower travel speeds are most often located in urban and densely built up areas where congestion occurs. Vehicle speeds fluctuate at different times of the day as well as different days of the week. When roadway volumes exceed capacity, travel speeds tend to slow significantly. Figures IV-12 & IV-13 show observed travel speeds for AM & PM peak periods on roadway segments studied between 2015 to 2018.

Turning Movement Counts (TMCs)

The CMMPO staff has studied numerous intersections over the years. The purpose of the intersection TMCs is to summarize the number of vehicle movements through an intersection during peak flow time periods. This type of volume summary is used in making decisions regarding the geometric design of the roadway, sign and signal installation, signal timing, pavement markings, traffic circulation patterns, capacity analysis, parking and loading zones, and vehicle classification. A Level-of-Service (LOS) is calculated for each studied intersection, with an "A" being given to the location with minimal delay progressing downward to an "F" assigned to an intersection with excessive delays or where the demand far exceeds capacity. Many intersections in the planning region have a poor LOS during peak travel periods in the morning and evening. These locations are concentrated in the urban communities with high volume roadways. In addition to regular single-occupant vehicle (SOV) travel, the amount of heavy vehicles traveling through intersections and on roadway segments can at times decrease speeds while increasing delays.

Bottlenecks

In 2008, FHWA and FTA guidance recommended that MPOs identify the top roadway bottleneck areas in their region. Since then, CMMPO staff has analyzed a total of 13 bottleneck areas in our Localized Bottleneck Reduction Program with the help of our Transportation



CMMPO

CENTRAL MASSACHUSETTS Regional Planning Commission

Figure IV-12 Observed AM Peak Hour Travel Speeds

Observed AM Peak Hour Average Speeds by Segment, 2015 - 2018*

*Based on observations recorded onselect sample days within thistime period.

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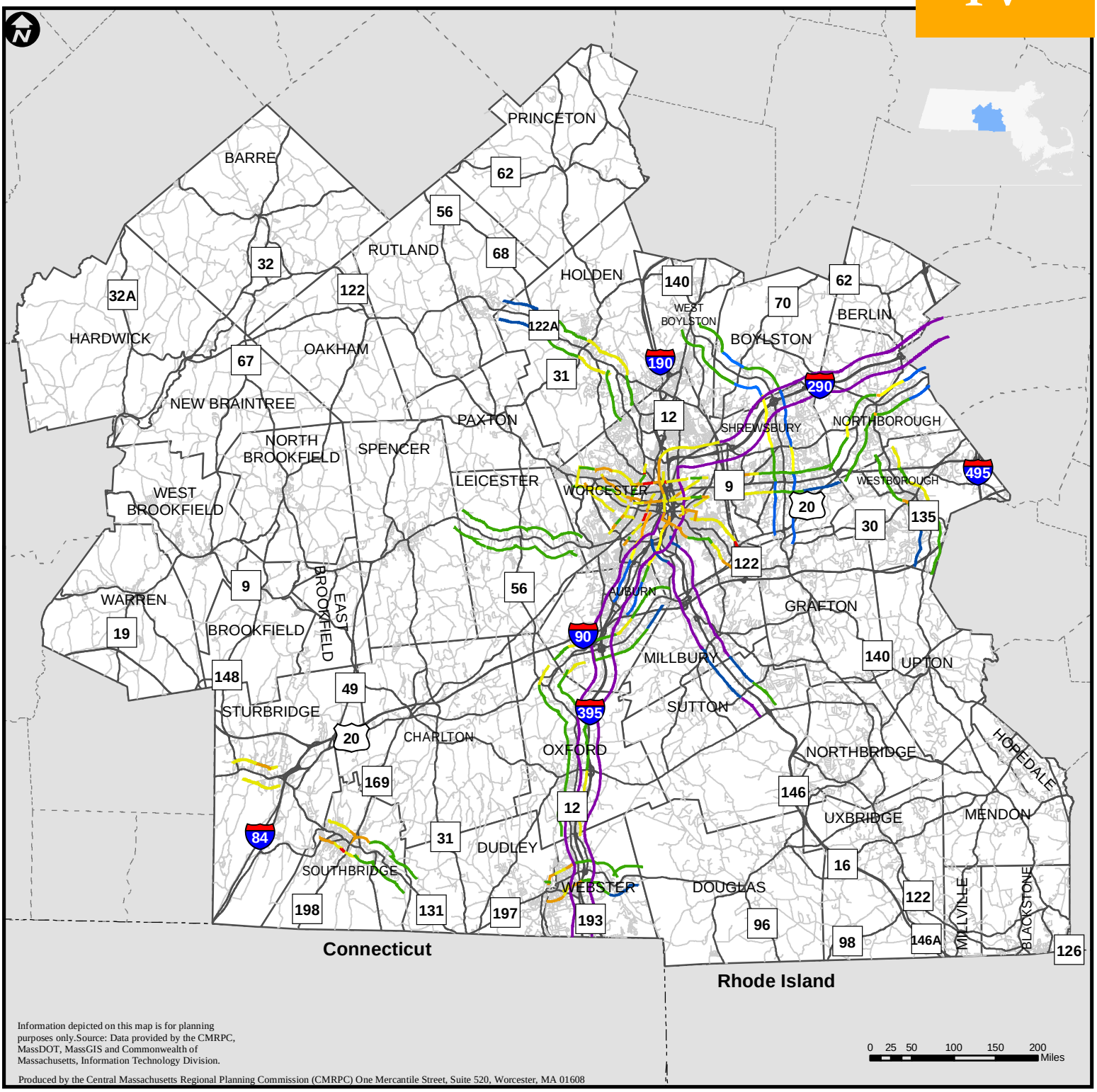
< 10 mph	20 - 29 mph	40 - 49 mph
10 - 19 mph	30 - 39 mph	> 49 mph



CMMPO

CENTRAL MASSACHUSETTS Regional Planning Commission

Figure IV-13 Observed PM Peak Hour Travel Speeds

Observed PM Peak Hour Average Speeds by Segment, 2015 - 2018*

*Based on observations recorded on select sample days within this time period.

- < 10 mph
- 10 - 19 mph
- 20 - 29 mph
- 30 - 39 mph
- 40 - 49 mph
- > 49 mph

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Management Systems and Transportation Model. A "traffic bottleneck" is a localized constriction of traffic flow, often on a highway segment that experiences reduced speeds and inherent delays, due to recurring operational influence or a nonrecurring impacting event. A bottleneck can be on high or low volume roadways. Table IV-10 shows the bottleneck locations that CMMPO staff has studied since 2011.

Table IV-10: Localized Bottleneck Reduction Program

City/Town	Location	Year Analyzed
Northbridge	Route 122 @ Church Street	2011
Spencer	Route 9 @ Route 31	2011
Worcester	Belmont Street @ I-290 Ramps (Exit 17)	2011
Charlton	Route 20: Between Route 169 & Route 31	2013
Oxford	Route 12 @ Sutton Avenue @ Charlton Street	2013
Westborough	Route 9 @ Lyman Street	2013
Auburn	Auburn Street: Between I-290 (Exit 9) & Brotherton Way	2014
Grafton	Route 122/140: Between Snow Road & Providence Road	2014
Worcester	Route 12 @ East & West Mountain Street	2014
Northborough	Route 20: Between Church Street & Hudson Street	2015
Holden	Route 122A: Between Shrewsbury Street & Route 68	2016
Auburn	Route 20: Between Worcester CL & South Street	2017
Worcester	Grafton Street: Between Waverly Street & Rice Square	2018

Park and Ride Lots

The CMMPO staff has been monitoring usage of the Berlin Park and Ride Lot since 1999. Staff expanded its monitoring activities to an additional four lots in 2013. Table IV-11 shows the five Park and Ride lots that have been studied. Three of the lots have over 100 spaces while the remaining two have considerably less. All lots are well utilized and are located near major highways and interstates. Additional Park and Ride information can be found on the MassDOT website at https://www.mass.gov/park-and-ride.

Table IV-11: MassDOT Maintained Park and Ride Lots in the CMRPC Region

Community	Location/Address	Capacity
Berlin	Route 62 at I-495, Exit #26	45
Auburn	Mid State Drive Adjacent to I-90, Exit #10	146
Millbury/Worcester	Route 20 at I-90, Exit #10A	446
Millbury	Route 122 at I-90, Exit #11	122
Sturbridge	Route 131 at I-84, Exit #3 (Bethlehem Lutheran Church Lot)	50

Other Considerations

Recently, the CMMPO staff has collected and used additional types of data to analyze congestion. Bicycle and pedestrian counts are completed during TMCs. The WRTA fixed-route transit is also studied to determine which routes, on average, are running more than two minutes late between timepoints. Heavy vehicle volumes are collected on the region's roadways and crash data is used to determine which intersections have a high amount of crashes that could potentially cause reoccurring congestion due to the frequency of crashes.

Needs Assessment

As the analysis of intersection and roadway segments are completed, the resulting data is added to CMMPO staff's list of encountered peak hour delay. The intersections are ranked based on the total number of minutes that drivers as a group wait at the intersection during the AM + PM peak hours. Currently, 215 intersections are included in the list between 2010 and 2018. The average total peak hour delay calculated from the list is 1,641 in-car minutes per hour. 59 of the 215 intersections caused delays that were above average. Based on the above mentioned data collection activities, there are various roadway deficiencies that need to be further analyzed and improvements that should be made, whether they are short-term or long-term in nature. The complete list of encountered delays for the 215 intersections can be found in the latest CMP Progress Report.

Travel Time and Delay studies are used to analyze roadway segments. The amount of congested time is used to determine if that segment of road is congested. Congested time is when a vehicle travels below 20 mph or 60% of the posted speed limit. A table showing the roadway segments that have more than five minutes of congested time was created for the CMP document. Other congestion-related data was analyzed to determine if it pertains to the same identified congested roadway segments.

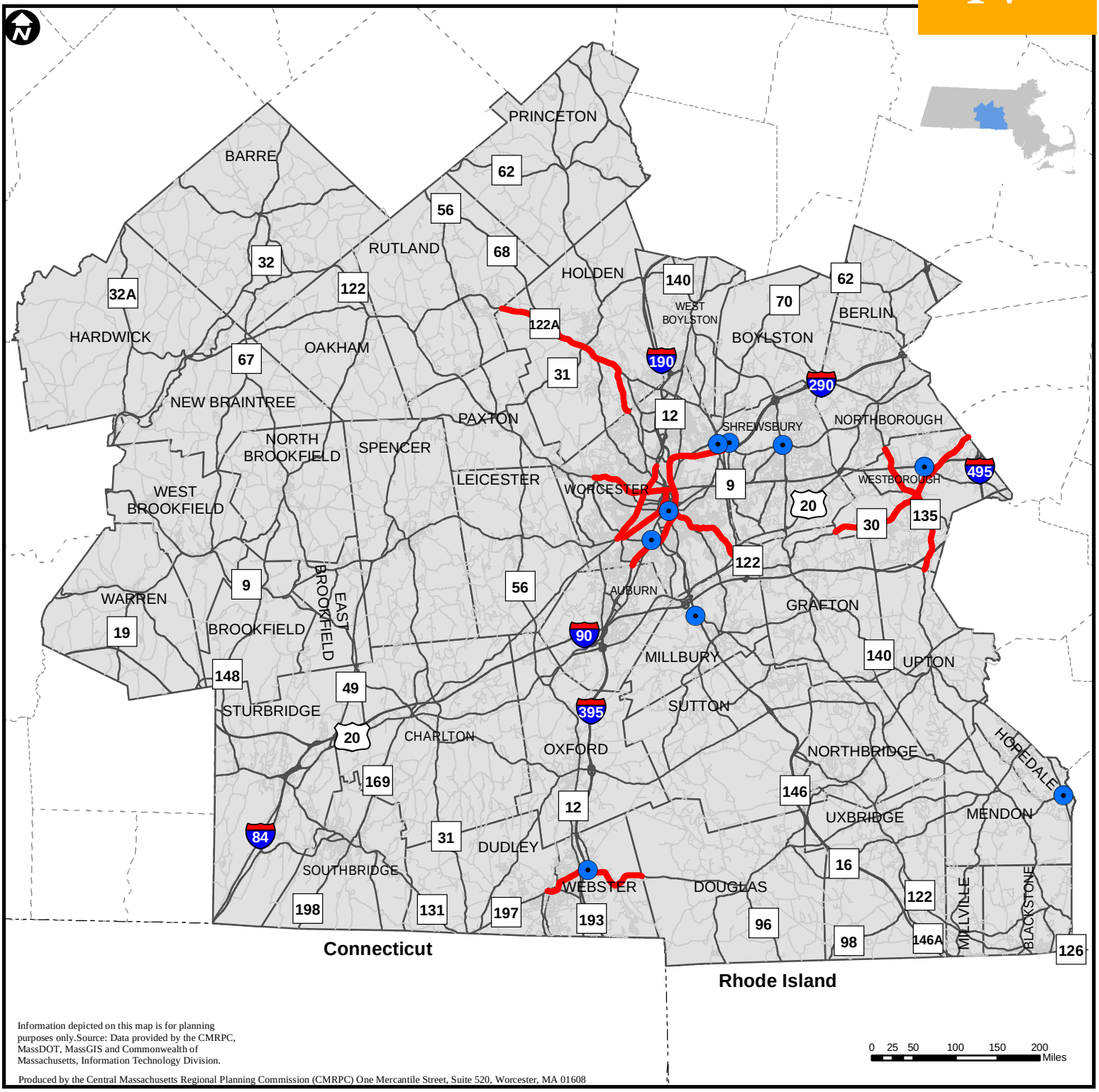
The purpose of implementing Park and Ride lots is to encourage carpooling as a way to reduce roadway traffic volumes and Vehicle Miles Traveled (VMT). The Auburn, Berlin, Sturbridge, and the Millbury Route 20 lots are heavily used and are usually near capacity. The Millbury Route 20 lot also allows tandem trailer parking. The remaining Millbury Route 122 lot was recently reconstructed and is only half utilized.

Congestion has many causes. Some are recurring, such as insufficient capacity, unrestrained demand, or poor signal timing, and some are non-recurring, such as collision incidents, poor weather, work zones, or emergencies. Most CMMPO region congestion is concentrated in the City of Worcester and the neighboring urban towns. Congestion can be found on local roads, highways, and Interstates. There are many improvement options to consider. There are short-term improvements such as adjusting signal timing and phasing, maintaining traffic control signage and pavement markings, maintaining good pavement, trimming overgrown vegetation along roadways that impair vehicle sight lines, maintaining roadway drainage structures, and access management techniques. These improvements can be quickly implemented at a low cost. Also for consideration are other options that are more costly and take longer to implement. Some of these are intersection realignment, installation of a modern roundabout, building additional lanes to increase capacity, and incorporating Intelligent Transportation Systems (ITS) capabilities or tools. See CMP Mitigation Toolbox for other ideas on relieving congestion, all of which may be considered in the region from time to time.

Prioritization

In concert with CMMPO goals and objectives, certain roadways and intersections should be improved first to produce the greatest congestion and travel time reductions. Performance measures help determine if a project should be undertaken as a result; a project that benefits multiple modes or management systems will get a higher priority over a proposed project that only helps one element.

Using the peak hour delay table for critical intersections in the planning regions, we find the top 10 locations that should be considered top priority for the region. Also, travel time and delay studies and other data analyses help determine the top 10 roadway segments in the region. Figure IV-14 shows the locations of these top 10 congested intersections as well as the top 10 congested roadway segments.



Information depicted on this map is for planning purposes only.Source: Data provided by the CMRPC, MassDOT, MassGIS and Commonwealth of Massachusetts, Information Technology Division.

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Figure IV-14 CMP Priority Locations

- Top Congested Intersections
- Top Congested Segments
- CMRPCTowns

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Table IV-12 is the list of the top 10 congested intersections. The total peak hour delay included in the table represents the total number of minutes that drivers as a group wait at the intersection during the AM + PM peak hours. Addressing these top 10 congested intersections should be a priority over other intersections in the region when roadway improvements are being made.

Table IV-12: Top 10 Congested Intersections Included in Regional CMP

Community	Intersection	Total Peak Hour Delay
Millbury	Route 122/Mass Pike	11647
Worcester	Foster St/Francis J McGrath/Franklin St/Green St	10908
Worcester	Cambridge St/Southbridge St	10501
Shrewsbury	Route 140/Main St	9099
Westborough	Route 9/Lyman St	8907
Shrewsbury	Main St/N Quinsigamond Ave/Holden St	8563
Mendon	Route 140/Hartford Ave	7720
Millbury	Main St/McCracken Rd/Route 146 SB Ramps/Shoppes	7660
Webster	I-395 NB Ramps/Route 16/Sutton Rd	7538
Worcester	Plantation St/Lincoln St	7306

Table IV-13 has been compiled based on the screening process and a ranking has been assigned to each of the ten congested roadway segments. Based on results from the other congestion-related analyses mentioned above, one point was given if any one analysis was within the congested roadway segment. A total of eight points is the potential maximum score if every data analysis was included within the segment. The roadway segments with the highest score should perhaps be given priority for implementing improvements, continued monitoring, or even further study. As can be seen from the table, Webster's, Route 12/16 corridor had the highest score with a five. Next, there were four roadway segments each with a total of four points. These include Holden (Route 122A), Worcester (Route 122), Worcester (Highland Street), and Worcester (Park Avenue).

Table IV-13: Top 10 Congested Roadway Segments Screening

Congested Travel Time Segment Locations	Top 10 Intersection Delay	Intersection LOS "E" or "F"	Identified Bottleneck	Bicycle & Pedestrian Activity	WRTA Bus Routes	15,000+ Vehicles Per Day	>10% Heavy Vehicles	Top 200 Crash Locations	Total Score
Webster – Routes 12/16	X	X		X		X		X	5
Holden – Route 122A		X	X			X	X		4
Worcester – Grafton St			X			X	X	X	4
Worcester – Highland St				X	X	X		X	4
Worcester – Park Ave				X	X	X		X	4
Westborough – Route 30		X		X		X			3
Worcester – Main St					X	X		X	3
Worcester – Pleasant St				X	X	X			3
Worcester – I-290						X	X		2
Westborough – Route 135 *& Upton Rd		X							1

Safety

Background

The CMMPO recognizes the importance of transportation safety planning for all users of the regional transportation system. It employs a multi-modal safety strategy covering roadway, transit, bicyclist, pedestrian and rail travel.

States are required to have a State Highway Safety Planning Program (SHSP) that identifies and analyze safety problems and opportunities in order to use the Highway Safety Improvement (HSIP) funds for new eligible activities under 23 USC 148. The FAST Act (the current Federal transportation appropriation) continues HSIP in order to achieve a significant reduction in traffic fatalities and serious injuries on all public roads, including non-state owned public roads and roads on tribal lands. The HSIP program requires a data-driven, strategic approach to improve highway safety on all public roads that focuses on performance. According to MassDOT, an HSIP eligible activity is any strategy, activity or project on a public road that is consistent with the data-driven Massachusetts Strategic Highway Safety Plan (SHSP) and corrects or improves a hazardous road location or feature, or addresses a highway safety problem.

The SHSP is developed in consultation with Federal, State, regional, local, and private sector safety stakeholders, and uses a data-driven, multidisciplinary approach involving the 4 Es of safety: engineering, education, enforcement, and emergency response to identify the plan's statewide goals, objectives, and emphasis areas.

The updated Massachusetts SHSP has a long term vision of working toward zero roadway fatalities. To date, fatality rates (annual five-year average of fatalities per 100 million vehicle miles traveled or VMT) had decreased since the first SHSP in 2006 from 0.74 to 0.64 in 2016. The goal is to continue that trend and achieve by 2022 a reduction in annual five-year average fatalities by 12% and serious injuries by 21%.

Performance Management

As discussed in Chapter II of this report, federal laws require performance based planning that supports its planning emphasis areas, one of which is safety. New federal guidance (PM1) related to safety performance measures were recently adopted by the CMMPO and are included in the new 2018 SHSP. The goals and measures are:

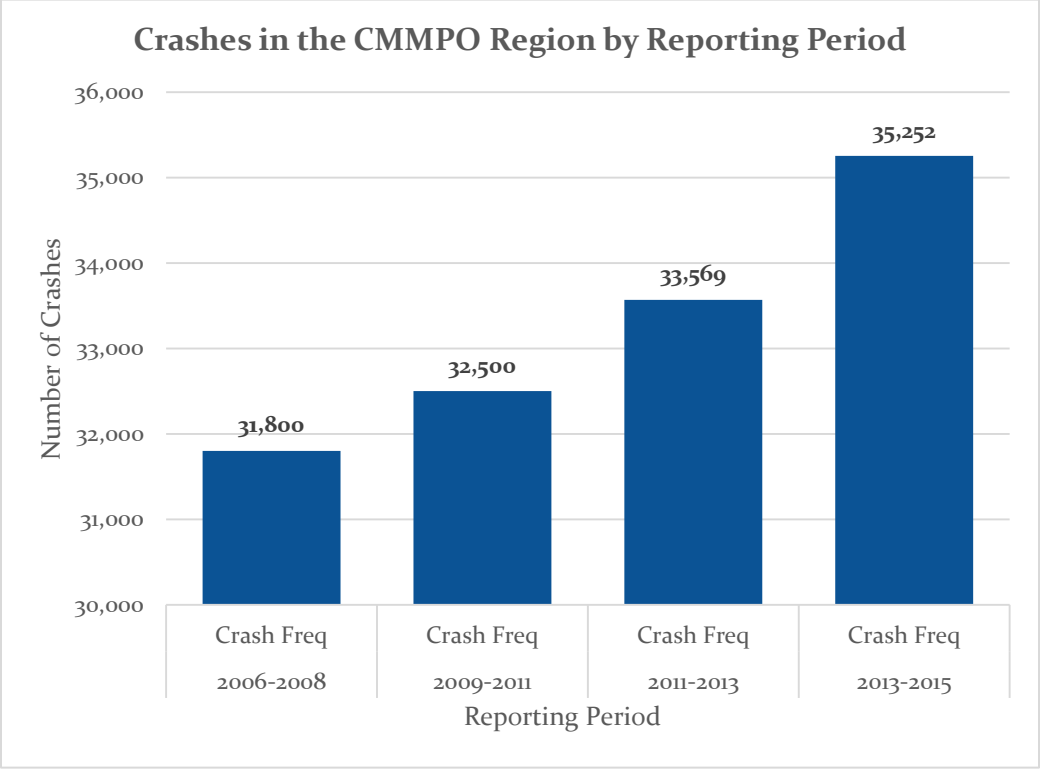
Goal 1 – Reduce number and rate of fatal and serious injury crashes in the region. Move towards zero deaths (PM1).

- Annual Five-year rolling averages for number of fatalities
- Rate of fatalities per 100 million VMT
- Annual Five-year rolling averages for number of serious injuries
- Rate of serious injuries per 100 million VMT
- Combined total number of non-motorized fatalities and non-motorized serious injuries involving a vehicle during a calendar year.

Analysis

As shown in Figure IV-15, the period of January 1, 2013 to December 31, 2015 the CMRPC region had 35,252 reported crashes, and 3,187 crashes, either un-reported or unknown crashes, for a total of 38,439 crashes, an average of 12,800 crashes per year. The crash frequency or number of crashes per year has seen an increase from a 3.3% in the period of 2011-2013 to 5.0% in the period of 2013-2015.

Figure IV-15



At least three-quarters of all crashes occurred in Worcester (55.8%), Auburn (6.7%), Westborough (6.4%) and Shrewsbury (6.3%). On the other hand, the towns with a frequency

less than 100 crashes are Millville (94), Hardwick (60), Oakham (59), New Braintree (37) and West Brookfield (30). Nearly a third of all crashes occurred at an urban minor arterial or rural major collector (29.7%). Only 10.2% of all crashes happened in the interstate and another 16.1% in local roads.

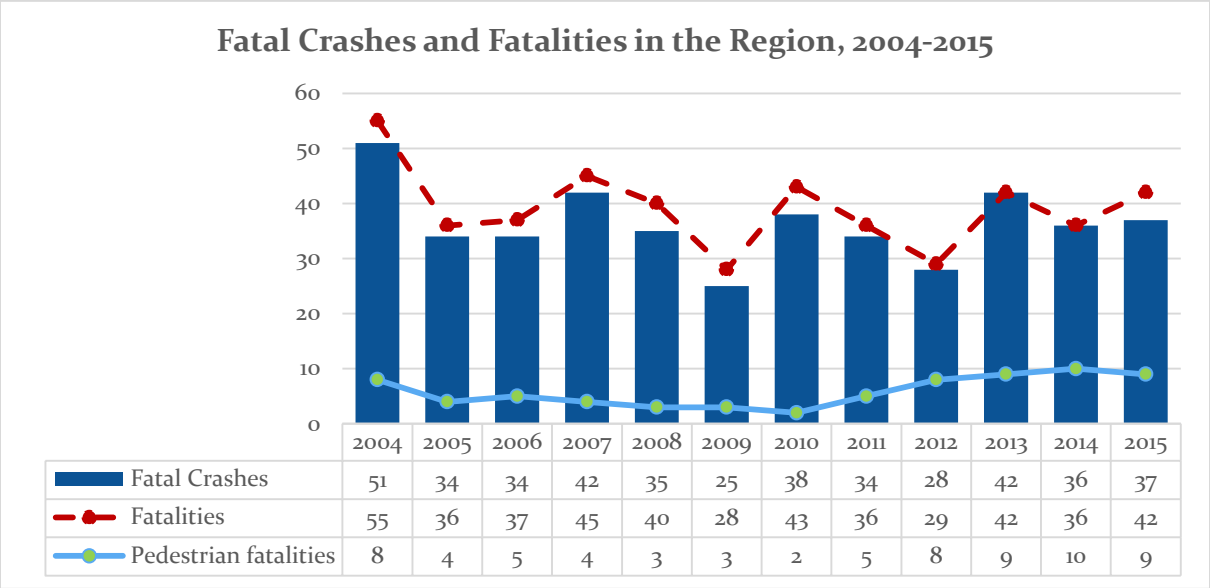
In terms of crash severity, during the period of 2013 to 2015the majority of the crashes, 69.4% were property damage only type of crashes, similar to previous reporting periods. Injury crashes represented another 22.0% and fatal crashes, 0.3%.

One of the long-term goals included in the Massachusetts Strategic Highway Safety Plan (SHSP) is attaining "Zero Deaths" consistent with Federal Highway Administration's vision of eliminating fatalities and serious injuries on roadways. It is important to recognize the difference between fatal crashes, which refer to events, versus fatalities, which refer to the death of individuals, whether they are drivers or passengers. In recognition of the "Vision Zero" approach, the CMMPO adopted the Commonwealth's safety performance measures.

During 2013-2015, the region experienced 116 fatal crashes. Almost every community in the CMMPO region experienced a fatal crash during this period, with the exception of the towns of Berlin, Blackstone, Hardwick, Hopedale, Millville, New Braintree, Princeton, and Warren. Overall, the region has seen an average annual reduction of 2.9% in fatal crashes since 2004, even though fatal crashes increased in the last three years.

In terms of fatalities, there were a total of 122 fatalities in the region. Worcester accounted for 28 fatalities, 8 in Oxford, and 6 each, Sturbridge and Webster. As shown in Figure IV-16, fatalities also experienced an average annual reduction of 2.4% during the period of 2004 to 2015. Nonetheless, the region experienced an increase in pedestrian fatalities, which had escalated to an average of 23.3% of all fatalities in the period of 2013 to 2015, peaking to 27.7% in 2014.

Figure IV-16



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Fatal Crashes	51	34	34	42	35	25	38	34	28	42	36	37
Fatalities	55	36	37	45	40	28	43	36	29	42	36	42
Pedestrian fatalities	8	4	5	4	3	3	2	5	8	9	10	9

Needs Assessment

Every year, MassDOT publishes a report with the State's Top 200 High Crash Locations, including the top 10 pedestrian and bicycle high crash locations. The locations are ranked by the highest EPDO to the lowest EPDO. From the state's Top 200 list, there are 28 intersections located in the CMMPO region, 21 of which are in Worcester. Other communities included in the Top 200 list are: Westborough (2), Shrewsbury (2), Webster (1), Auburn (1), and Sutton (1). These locations are considered higher priority within the CMMPO region. Table IV-14 and Figure IV-17 show these locations included in the listing.

During the period of 2006 to 2015 the only pedestrian crash cluster included in the State's top 10 priority list, is Main Street at the Worcester downtown area, from Thomas Street to Sycamore Street, including the intersection with Pleasant Street and Chandler Street. This location ranked 5 in the State's list and has a total EPDO of 342. During this period, a total of 90 crashes were included in this cluster. None of them were fatal, but 70% of these crashes were injury crashes.

Moreover, MassDOT generates a list of HSIP eligible Auto, Bike, and Pedestrian clusters for the Commonwealth. A list of HSIP eligible locations for the CMMPO planning region is derived from the statewide list. Data for the period 2013- 2015 includes a total of 181 automobile, 7 bicycle, and 11 pedestrian clusters identified as HSIP eligible in the region (does not include interstate crash clusters).

Table IV-14 Region's Intersections included in the Top 200 High Crash Locations

Rank	City / Town	Intersection	EPDO
1	Worcester	Kelley Square / Water Street	542
19	Worcester	Belmont Street / Edward Street	186
20	Webster	Worcester Road / East Main Street	185
33	Worcester	Chandler Street / Murray Avenue	160
39	Worcester	Park Avenue / May Street	152
55	Westborough	Boston-Worcester Turnpike / Otis Street	140
59	Worcester	Main Street / Park Avenue	138
62	Worcester	Harvard Street / Lincoln Square	135
67	Worcester	Park Avenue / Maywood Street	132
77	Worcester	Main Street / Chandler Street	129
80	Worcester	Southbridge Street / Hammond Street	128
83	Worcester	Chandler Street / Mason Street	126
91	Shrewsbury	Hartford Turnpike / Grafton Street	124
95	Westborough	Boston-Worcester Turnpike / Lyman Street	122
103	Worcester	Southbridge Street / Madison Street	119
110	Auburn	Washington Street / Millbury Street	118
114	Worcester	Main Street / Mill Street	117
116	Worcester	East Central Street / Summer Street	116
120	Worcester	Grafton Street / Mendon Street	114
120	Worcester	Highland Street (Lincoln Square) / Main Street	114
120	Worcester	Lincoln Street / Beverly Road	114
140	Worcester	Main Street / May Street	110
150	Worcester	Highland Street / Park Avenue	107
155	Worcester	Chandler Street / Piedmont Street	106
158	Worcester	Main Street / Curtis Parkway	105
161	Worcester	Canterbury Street / Gardner Street	104
171	Sutton	Worcester-Providence Turnpike / Boston Road	102
185	Shrewsbury	Boston Turnpike / South Street	100

Communities that wish to pursue HSIP funding for a transportation safety improvement project at any of the HSIP-eligible locations will need to perform a Road Safety Audit (RSA). The RSA have been held for all projects receiving HSIP funding in the CMMPO region. Through the RSA process, potential safety issues are identified and includes recommendations and countermeasures. Refer to the CMMPO Transportation improvement Program (TIP) for examples of transportation improvement projects funded through the HSIP program.

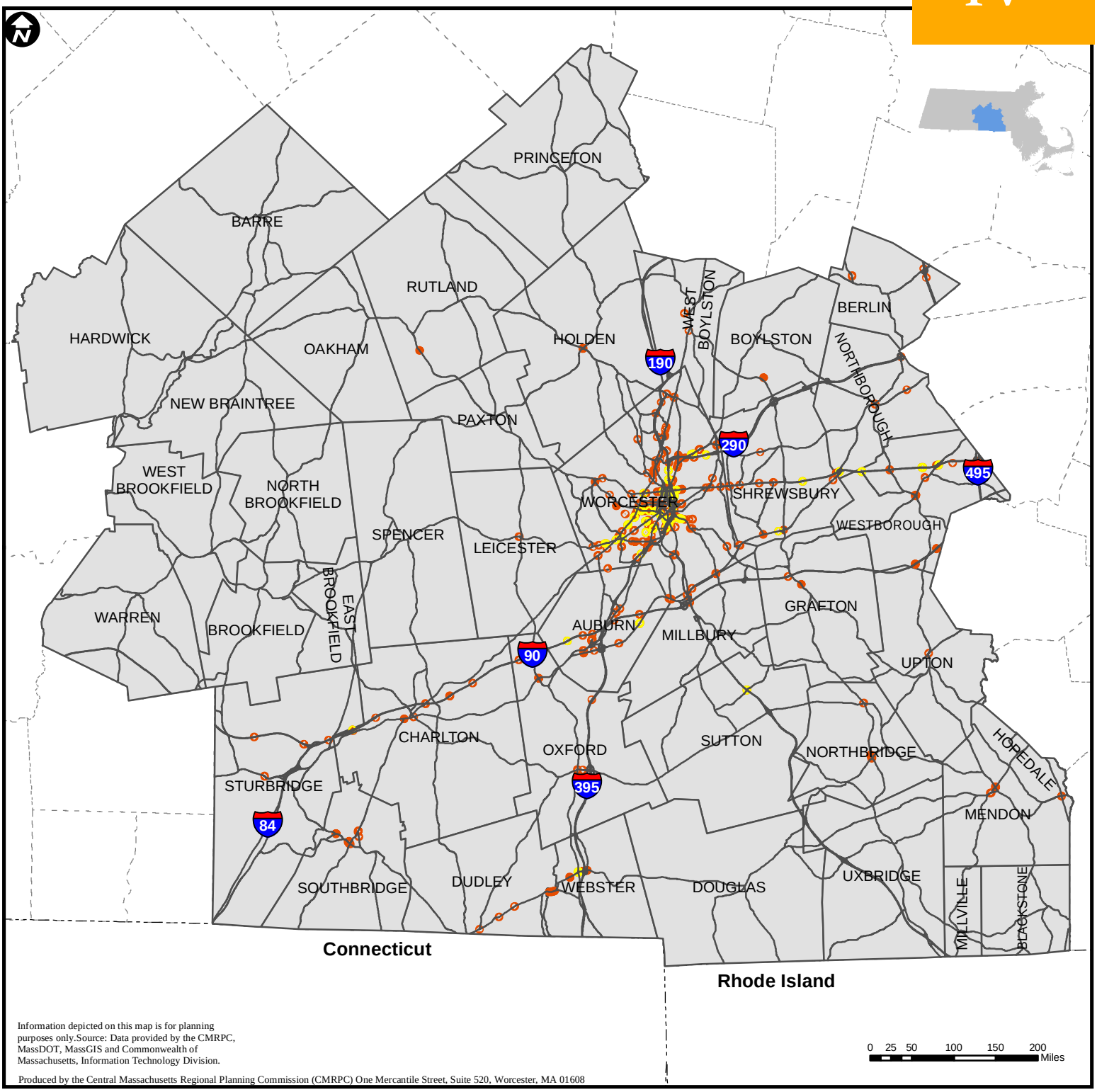


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Figure IV-17 Region's Intersections in the Top 200 High Crash Locations

Top 200 HSIP 2013-15

HSIP Eligible Crash Clusters 2013-15

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Prioritization

The priority for safety improvements are the result of the performance management system based on a data-driven process. As such, the order of priority for safety improvements in the CMMPO region uses a tier approach. This approach applies to auto, pedestrian and bicycle crashes.

The first tier includes the locations listed in the Top 200 High Crash Locations and Top 10 Pedestrian and Bicycle Crash Locations. The second tier are those locations that are HSIP eligible but are not on the Statewide Top 200 list. The second tier includes 153 locations within the CMMPO region. The third and last tier of priority are those locations with a high frequency of crashes or with a crash cluster but are not HSIP eligible.

Further guidance is expected as to how to prioritize HSIP locations that will advance the "Zero Deaths" goal. A closer look to the HSIP eligible locations in the region result in only 9 locations where a fatality was recorded. A pedestrian was involved in four of the 9 fatal crashes recorded at HSIP locations during the period of 2013-2015 (See Table IV-15). Moving forward, the CMMPO should consider revisiting the prioritization of HSIP-eligible projects considering that none of these 9 locations are included in the Top 200 High Crash Locations.

Table IV-15: Region's HSIP-eligible Intersections with Reported Fatal Crashes not included in the Top 200 High Crash Locations

EPDO	Community	Crash Count	Fatal Crashes	Injury Crashes	PDO Crashes	Location	Non-Motorist
80	Worcester	31	1	10	20	Chandler Street (SR 122A, SR 122)	Pedestrian
72	Worcester	31	1	8	22	Grafton Street (SR 122)	Pedestrian
64	Shrewsbury	27	1	7	19	Memorial Drive / Hartford Turnpike (SR 140)	
58	Dudley	13	1	9	3	W. Main Street (SR 197) / Center Road	
49	Worcester	16	1	6	9	Lincoln Street (SR 70)	Pedestrian
48	Worcester	15	1	6	8	Lincoln Street (SR 70) / Burncoat Street	Pedestrian
45	Worcester	16	1	5	10	Southbridge Street / Gladstone Street	
42	Worcester	21	1	3	17	Salisbury Street / Forest Street	
41	Shrewsbury	16	1	4	11	Main Street	

Pavement and State of Good Repair

Background

In an effort to take a more holistic view of the transportation system, the CMMPO staff has taken an asset management approach to view the condition of the regions roadways. To support this effort CMMPO staff assesses the condition of the pavement, sidewalks and ramps on all federal-aid eligible roadways. In addition to this effort the CMMPO staff utilizes existing statewide programs that asses the condition of bridges and culverts on the federal-aid network.

Pavement

CMMPO staff conducts a windshield survey gathering detailed information in nine categories of pavement distresses. The staff also collects length and width of a segment and rates the drainage infrastructure and the comfort of the ride. The data collected in the field is entered into *Cartegraph*, an asset management software package developed and supported by Cartegraph Systems Incorporated. It is used to inventory, quantifiably rate and analyze pavement distress information. *Cartegraph* determines an Overall Condition Index (OCI) for each segment based upon the pavement ratings and nature of the distresses. The OCI is a score used to rate each inspected segment on a scale from 0 to 100. An OCI of 100 indicates optimal pavement conditions, while an OCI of 0 indicates that a road is in very poor condition and in need of extreme repairs. The score is calculated by subtracting a series of deduct values associated with the severity and extent of the various pavement distresses described above. *Cartegraph's* deduct values are determined through a series of deduct curves, which were developed by pavement engineers using years of research on pavement performance. The resulting OCI is a quantified rating of pavement condition. The state Department of Transportation collects data on state-maintained roads. This data is incorporated into the CMMPO database for roads not collected by the CMMPO to create a comprehensive map of all federal-aid eligible roadway conditions in the region.

Table IV-16 depicts the OCI range related to pavement condition ratings and the costs associated with the recommended action for the pavement in each of the categories.In addition, the table shows that the OCI scores are separated into five categories ranging from "excellent" to "very poor." Each category is associated with a recommended repair strategy for pavement segments scored in that range. These recommended actions are used in budget scenarios to create maintenance and rehabilitation plans.

Table IV-16: Overall Condition Index and Recommendations

OCI Range	Pavement Condition	Recommended Action	Cost/ Sq. Yard
0 - 24	Very Poor	**Base Rehabilitation –** represents roads that exhibit weakened pavement foundation base layers. Complete reconstruction and full depth reclamation fall in this category	$50.00
25 - 47	Poor	**Structural Improvement –** when the pavement deteriorates beyond the need for surface maintenance applications, but the road base appears to be sound. These include structural overlays, shim and overlay, cold planeing and overlay, and hot in-place recycling.	$20.00
48 - 67	Fair	**Preventive Maintenance -** slightly greater response to more pronounced signs of age and wear. This includes crack sealing, full-depth patching, and minor leveling, as well as surface treatments such as chip seals, micro-surfacing, and thin overlays.	$8.00
68 - 87	Good	**Routine Maintenance -** used on roads in reasonably good condition to prevent deterioration from the normal effects of traffic and pavement age. This treatment category would include either crack sealing or local repair (pot hole, depression, poorly constructed utility patch, etc.), or minor localized leveling.	$0.75
88 - 100	Excellent	**Do Nothing -** used when a road is in relatively perfect condition and prescribes no maintenance.	$0.00

Sidewalks and Curb Ramps

CMMPO staff conducts a walking survey of federal-aid road segments identified as having sidewalks and curb ramps. The width, length and material of the sidewalk sections are recorded in the CMMPO sidewalk and curb ramp database. Condition rankings are given to each sidewalk and ramp based on the CMMPO Sidewalk and ADA Ramp field collection guide. The table below depicts the category ratings that are used during data collection. Table IV-17 depicts the sidewalk and curb ramp condition ratings and the costs associated with the recommended action for the sidewalk or ramp in each of the categories. Each category is associated with a recommended repair strategy for sidewalks or ramps scored in that category. These recommended actions are used in budget scenarios to create maintenance and rehabilitation plans.

Table IV-17: Sidewalk and Curb Ramp Condition and Recommendations

Sidewalks			
Condition	Condition Description	Recommended Action	Cost/foot
Excellent	New or like new sidewalk. No detectable cracks with a even walking surface	Routine Maintenance	$ -
Good	Very few detectable cracks that do not impede usage with an even walking surface	Routine Maintenance	$ -
Fair	Many cracks detectable that may impede usage. Surface is bumpy or uneven that may make it difficult to use.	Spot Reconstruction	$ 75.00
Poor	Many cracks detectable that impede usage. Surface is very bumpy and difficult to navigate on foot.	Reconstruction	$ 75.00
Curb Ramps			
Condition	Condition Description	Recommended Action	Cost/per location
Compliant	Ramp was in overall good condition and a detectable warning panel was present at the time of survey.	Routine Maintenance	$ -
Historic	Ramp was in good condition, but a Detectable Warning Panel is not present at the time of survey.	Ramp Retro Fit	$ 300.00
Non-Compliant	Ramp is present but is in poor condition and no Detectable warning panel is present	Reconstruction	$ 2,500.00
No Ramp	No form of a ramp but may have a sidewalk leading to them or another indication that a ramp should be located there.	Reconstruction	$ 2,500.00

Bridges

MassDOT has a Bridge Inspection Management System (BIMS) that inventories the location and available inspection data for bridges. The National Bridge Inventory (NBI) is a national database maintained by the Federal Highway Administration (FHWA) that contains the type, condition, and inspection data for any bridge over 20 feet long. These bridges are inspected on a biannual basis. The condition of bridges are evaluated in four major categories (deck, superstructure, substructure and culvert) and ranked on a scale of 0-9. If any of these categories receive a ranking of 4 or less they are considered to be “structurally deficient”, meaning there is a need for further monitoring and/or repair. To date, complete inspections are only available for all NBI bridges in Massachusetts, but inspection and inventory efforts are underway for all short span bridges and culverts in Massachusetts.

Performance Management

As discussed in Chapter II of this report, federal laws require performance based planning that supports its planning emphasis areas, one of which is State of Good Repair. Besides the federal performance measures, the CMMPO also have a number of regional goals and measures that are followed. In this section, goal 1 is related to FHWA Rule PM2 while goal 2 is a regional goal. The measures and targets for these goals are as follows:

Goal 1 – Maintain the highway infrastructure asset system in a state of good repair (PM2)

- 70% of Non-Interstate NHS pavement in good condition.
- 30% of Non-Interstate NHS pavement in good condition.
- 4% of NHS Interstate pavement in poor condition.
- 30% of NHS Interstate pavement in poor condition.
- 16% of NHS bridge by deck area in good condition.
- 12% of NHS bridges by deck area in poor condition.

Goal 2 – Improve transportation accessibility for all modes by improving roadway infrastructure

- Reduce mileage of sidewalks in poor condition by 10% over 10 years.
- Increase the number of ADA-compliant ramps in region by 100 per year over 10 years.

Analysis

Existing Condition

Pavement

Using the OCI scores calculated from the collected data, CMMPO staff determined that the regional network OCI is 72.74. Of the region's 1,122 federal-aid eligible road network miles, 381.26 miles are in "excellent" condition, 351.96 miles are in "good" condition, 268.62 miles are in "fair" condition, 101.18 miles are in "poor" condition, and 19.69 miles are in "very poor" condition. Figure IV-18 depicts how the regional federal-aid eligible road network conditions are assigned into State and Town Jurisdictions. The towns own and maintain about 847 miles of roadways while MassDOT owns and maintains the remaining 275 miles.

Figure IV-18: Federal Aid Eligible Roads by Condition

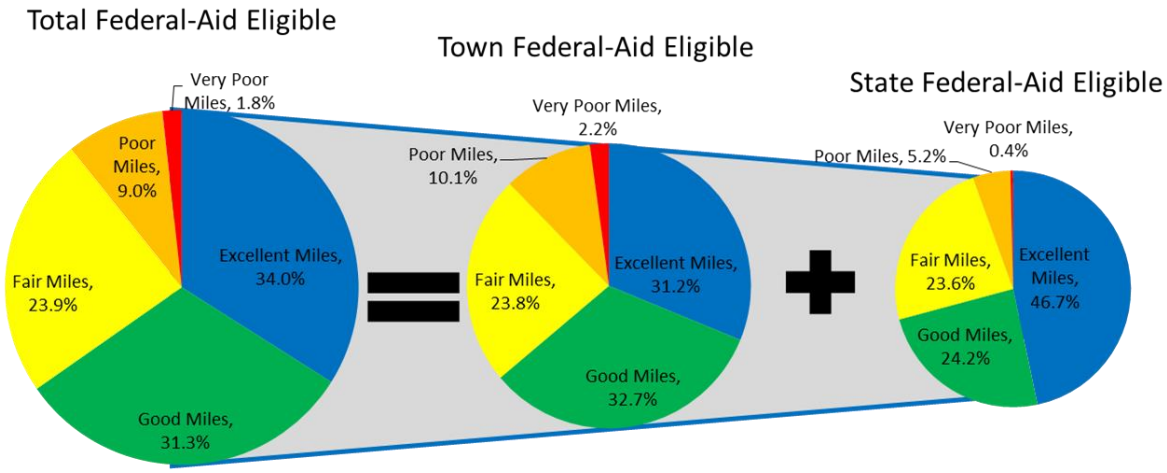

Figure IV-19 shows the observed pavement conditions for federal-aid roadways, not including Interstates, from 2016 to 2018.

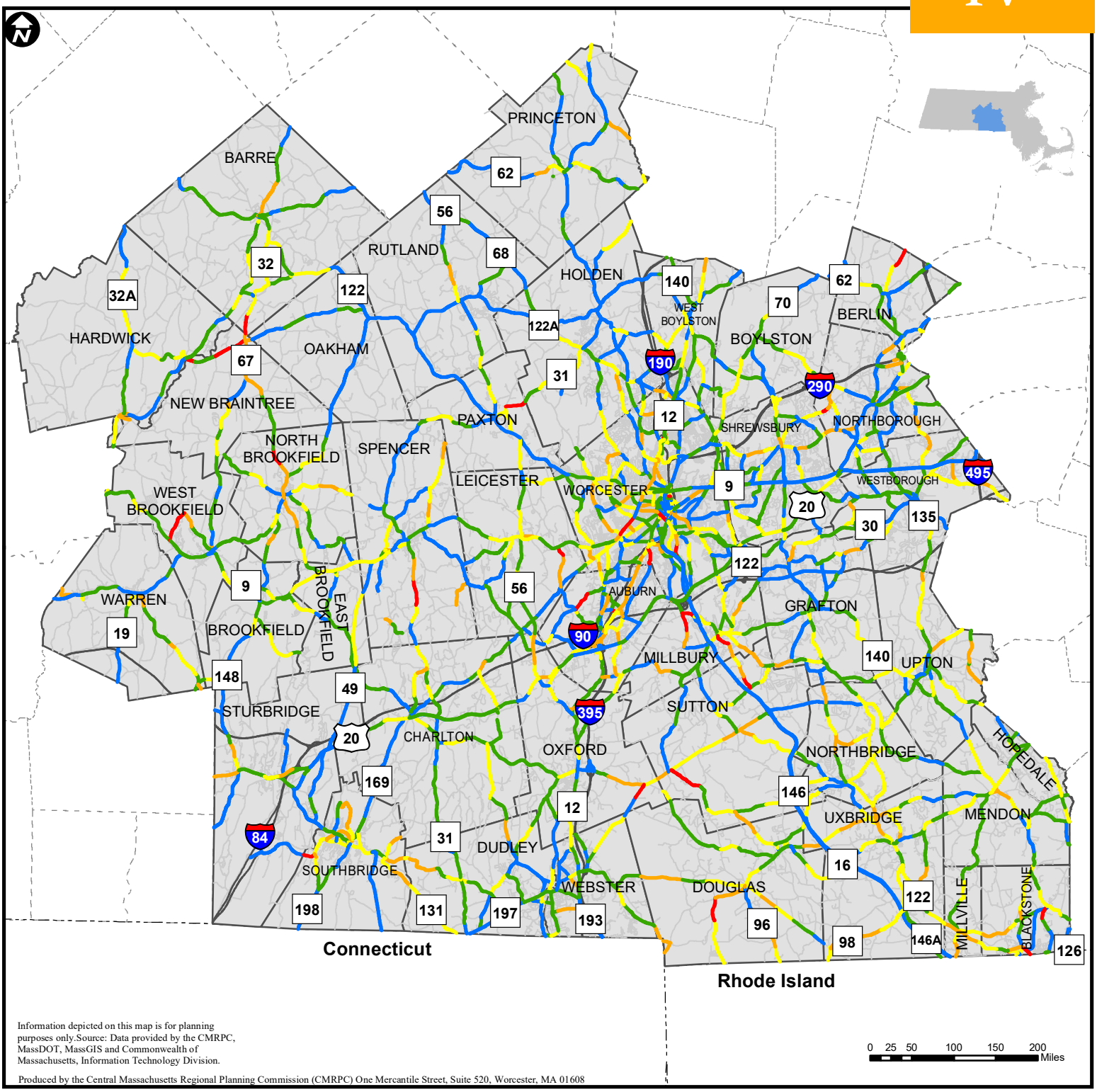

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Figure IV-19 Observed Pavement Conditions

Observed Conditions

- Excellent
- Poor
- Fair
- Very Poor
- Good
- CMRPCTowns

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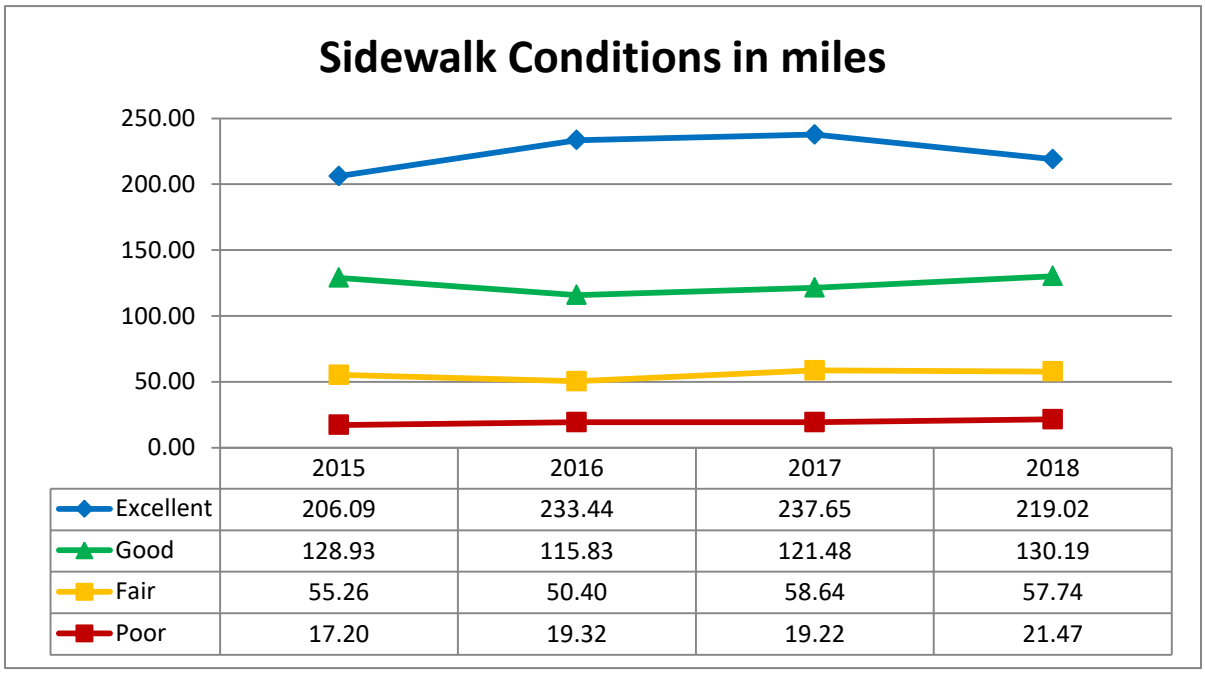
Sidewalks and Curb Ramps

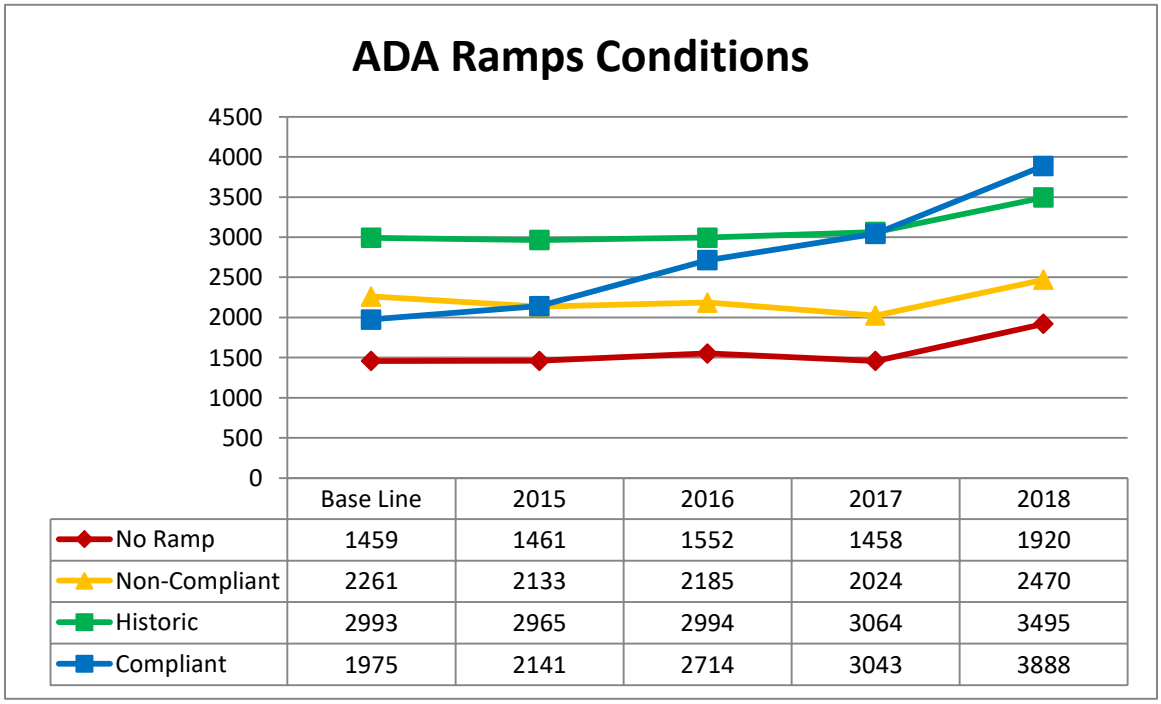
Based on the information gathered from the walking surveys there are 443.6 miles of sidewalks and 11,866 ADA Ramp locations along federal-aid eligible roadways. Figures IV-20 and IV-21 illustrate the condition trends for sidewalks and ADA ramps.

Figure IV-20: Sidewalk Condition Trend



	2015	2016	2017	2018
Excellent	206.09	233.44	237.65	219.02
Good	128.93	115.83	121.48	130.19
Fair	55.26	50.40	58.64	57.74
Poor	17.20	19.32	19.22	21.47

Figure IV-21: Curb Ramp Condition Trend



	Base Line	2015	2016	2017	2018
No Ramp	1459	1461	1552	1458	1920
Non-Compliant	2261	2133	2185	2024	2470
Historic	2993	2965	2994	3064	3495
Compliant	1975	2141	2714	3043	3888

In the CMMPO region there are:

- 79.21 miles of sidewalks in “fair” or “poor” condition which, would be difficult for some users to navigate safely.
- 1,920 locations have been identified as “no ramp” locations. These areas currently have no form of a ramp but may have a sidewalk leading to them or another indication that a ramp should be located there.
- 3,495 locations have been identified as “historic”. This means that the current ramp is in good condition, but a Detectable Warning Panel is not present.
- 2,470 locations have been identified as “Non-Compliant”, which means the current ramp is in poor condition.
- 3,888 locations have been identified as “compliant”. This means that when surveyed the ramp was in overall good condition and a detectable warning panel was present.

Figures IV-22 and IV-23 show the observed sidewalk conditions and curb ramp conditions for federal-aid roadway, not including Interstate, from 2016 to 2018.

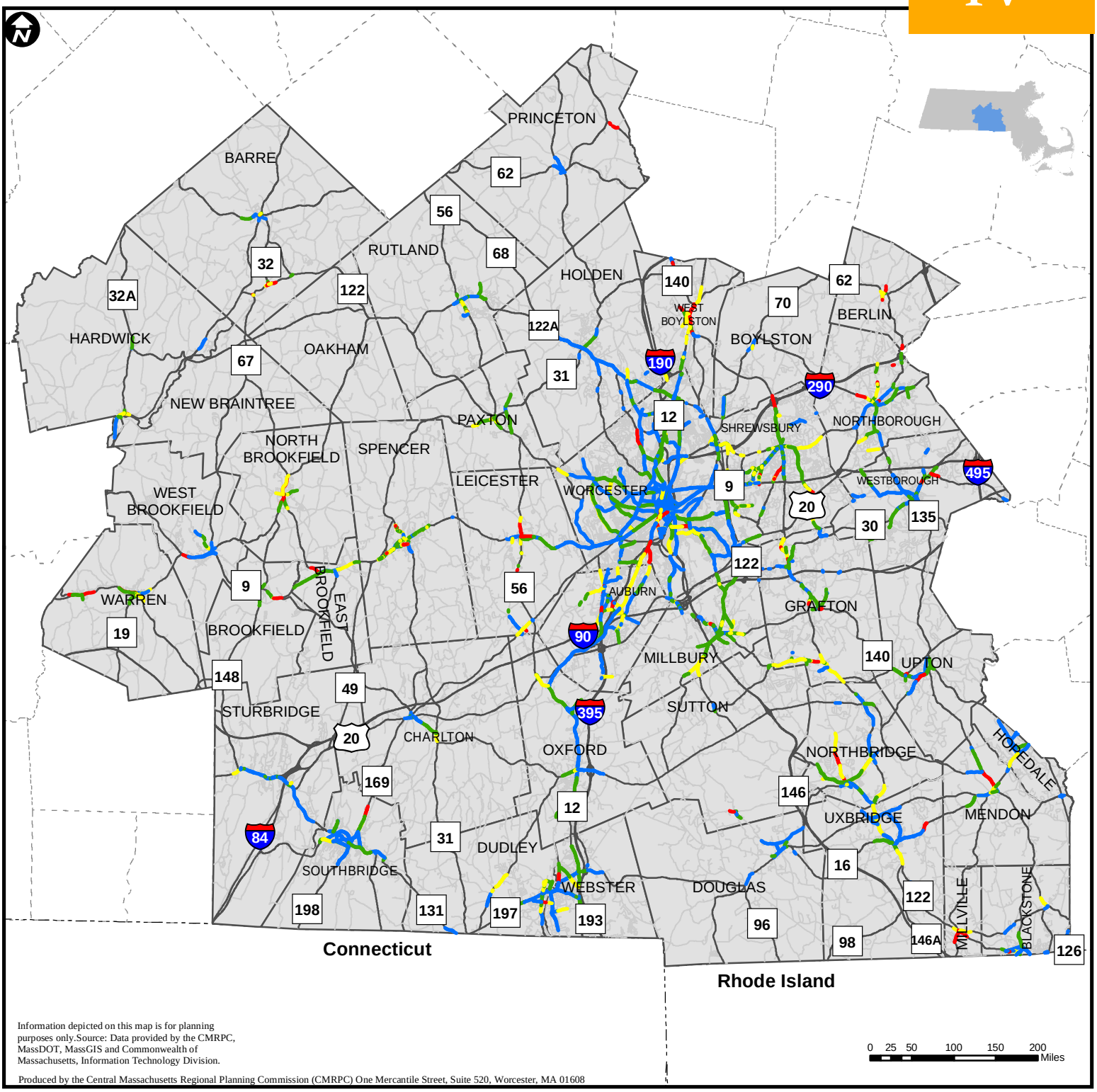


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Figure IV-22 Observed Sidewalk Conditions

Observed Conditions

Excellent
Good
Fair
Poor
CMRPCTowns

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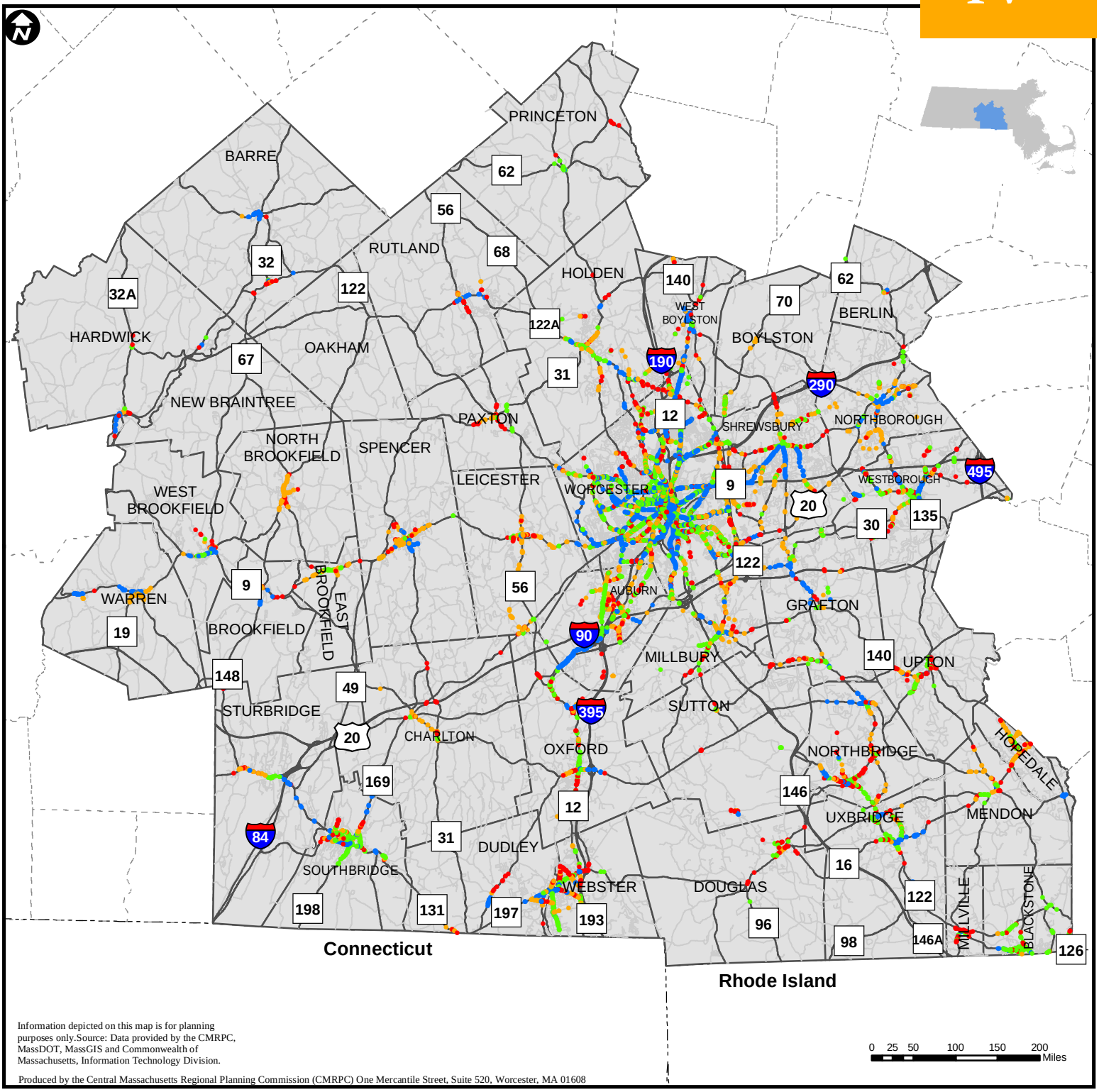

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Figure IV-23 Observed Curb Ramp Conditions

Observed Conditions

- Compliant
- No Ramp
- Historic
- Non-Compliant
- CMRPCTowns

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Bridges

There are 661 structures identified in the MassDOT Bridge Inspection Management System (BIMS) in the CMRPC region. Tables IV-18 and IV-19 details bridge ownership and the condition of the bridges.

Table IV-18: Condition of bridges by total number

Jurisdiction	Total Number	Total Number on NHS	Structurally Deficient	Structurally Deficient on NHS
Municipality	209	5	16	0
MassDOT	451	280	34	19
Other State Agencies	1	0	1	0

Table IV-19: Condition of bridges by area

Jurisdiction	Total Area	Total Area on NHS	Structurally Deficient Area	Structurally Deficient Area on NHS
Municipality	37378	1954.4	2521.1	0
MassDOT	342677.6	253257	30851.4	24821.6
Other State Agencies	65.4	0	65.4	0

Cost of Repair

Pavement

Once the condition of the network is established, determining the cost to repair and maintain the network is the next step. In the CMMPO pavement management program, the OCI ranges are associated with a recommended repair action and a repair cost. Table IV-16, previously mentioned, showed the OCI ranges along with an activity description and the cost. The cost is per square yard and is applied against the area of a segment to determine an estimated repair cost.

Using these tools, staff estimates that it would cost $49 million in FFY19 funds to bring all of the roads in the federal-aid eligible network to “excellent” condition. To maintain the current network condition going forward would require approximately $38 million per year, and the total outstanding backlog for the region would be $154.2 million dollars.

Sidewalks and Curb Ramps

The CMMPO has done extensive work with communities on establishing a plan through Complete Streets program. Cost estimations have been developed and can be used to estimate the total backlog of work. The cost estimations for replacing a deteriorated sidewalk would cost $75 per linear foot, replacing a curb ramps would cost $2,500 per location and retrofitting a ramp with a Detectable Warning Panel would cost about $300 per location. Utilizing those calculations it is estimated that it would cost $31.3 million to replace all of the poor and fair sidewalks in the region. It is also estimated that it would cost $10.9 million to replace all of the

no ramp and non-compliant ramp locations with modern curb ramps and $874,000 to retrofit all “historic” ramps with detectable warning panels.

Bridges

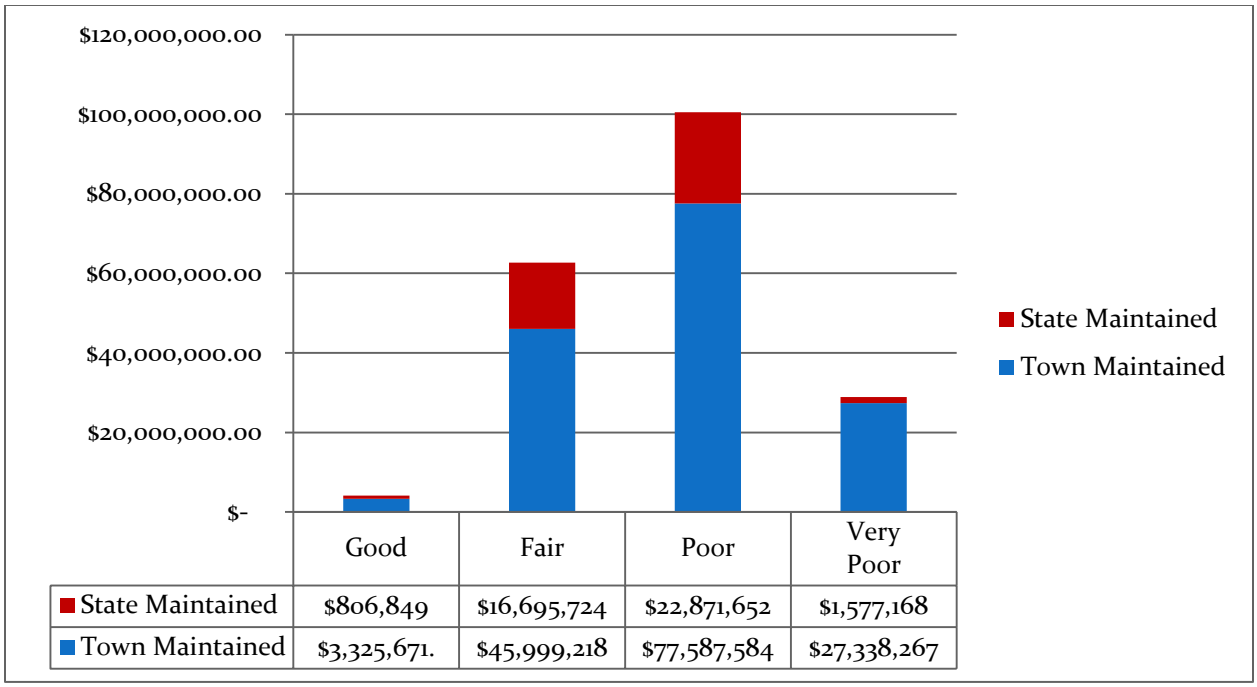
According to the 2019 – 2023 Capital Investment Plan (CIP), the total funding allocated to bridges in Massachusetts is $2.281 Billion. There is another $50 Million available in funding for municipal owned bridges with a span of less than 20 feet. There are a total of 5,660 bridges in Massachusetts. 516 of the bridges are considered structurally deficient and 198 of those bridges are on the National Highway System (NHS). In the CMMPO region, there are 661 bridges. 51 are structurally deficient and 19 are on the NHS.

Needs Assessment

Pavement

Figure IV-24 displays a break down by responsible jurisdiction of the maintenance costs. The 40 towns in the CMMPO region are responsible for 846 miles of roadway with a backlog of $154.4 million. MassDOT is responsible for 257 miles of roadway with a backlog of $41.9 million.

Figure IV-24: Regional Backlog by Condition



	Good	Fair	Poor	Very Poor
State Maintained	$806,849	$16,695,724	$22,871,652	$1,577,168
Town Maintained	$3,325,671.	$45,999,218	$77,587,584	$27,338,267

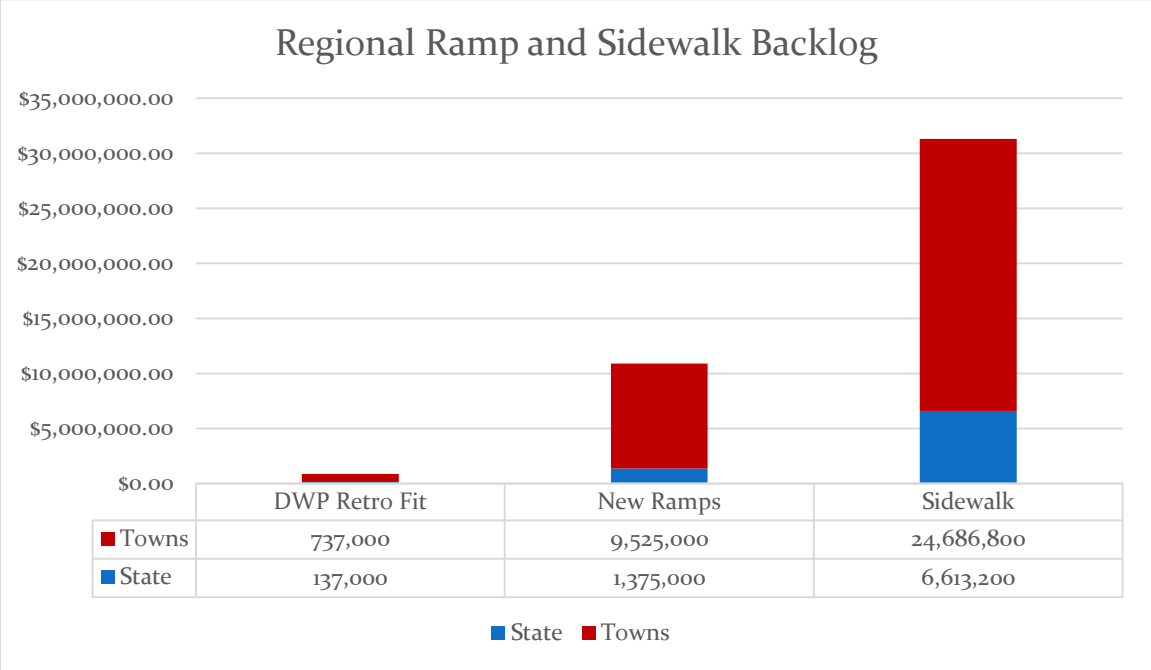
In the CMMPO region, towns bear the largest burden for road maintenance. Funding to maintain these roadways comes through the Transportation Improvement Program, Chapter 90 funding, or from the towns themselves. Chapter 90 is a program in which the state allocates a

calculated portion of money to each municipality to help maintain all of its owned roads. CMMPO staff has identified an approximate $10 million annual funding shortfall to maintain the current federal-aid system, as these same resources are stretched to address congestion, safety, and other transportation issues including the maintenance of non-federal-aid eligible roads. The CMMPO towns have the added burden of local roads that are ineligible for federal-aid funding.

Sidewalks and Curb Ramps

Figure IV-25 shows a breakdown by responsible jurisdiction of the needed repairs to the CMMPO regions federal-aid sidewalk network. Similar to road maintenance, the funding for these repairs comes through the Transportation Improvement Program, Chapter 90 funding, or from the towns themselves.

Figure IV-25: Regional Ramp and Sidewalk Backlog by Jurisdiction



Bridges

Previously shown in Tables IV-18 and IV-19, all “structurally deficient” bridges on the NHS and the majority on non-NHS roads are under MassDOT jurisdiction. 16 of the of the 51 “structurally deficient” bridges are owned by the municipalities. For town-owned bridges that are federal-aid eligible, the Transportation Improvement Program can be used for funding of repairs. For non-federal-aid bridges, Chapter 90 funding or even town funds could be used for repairs.

Prioritization

Pavement

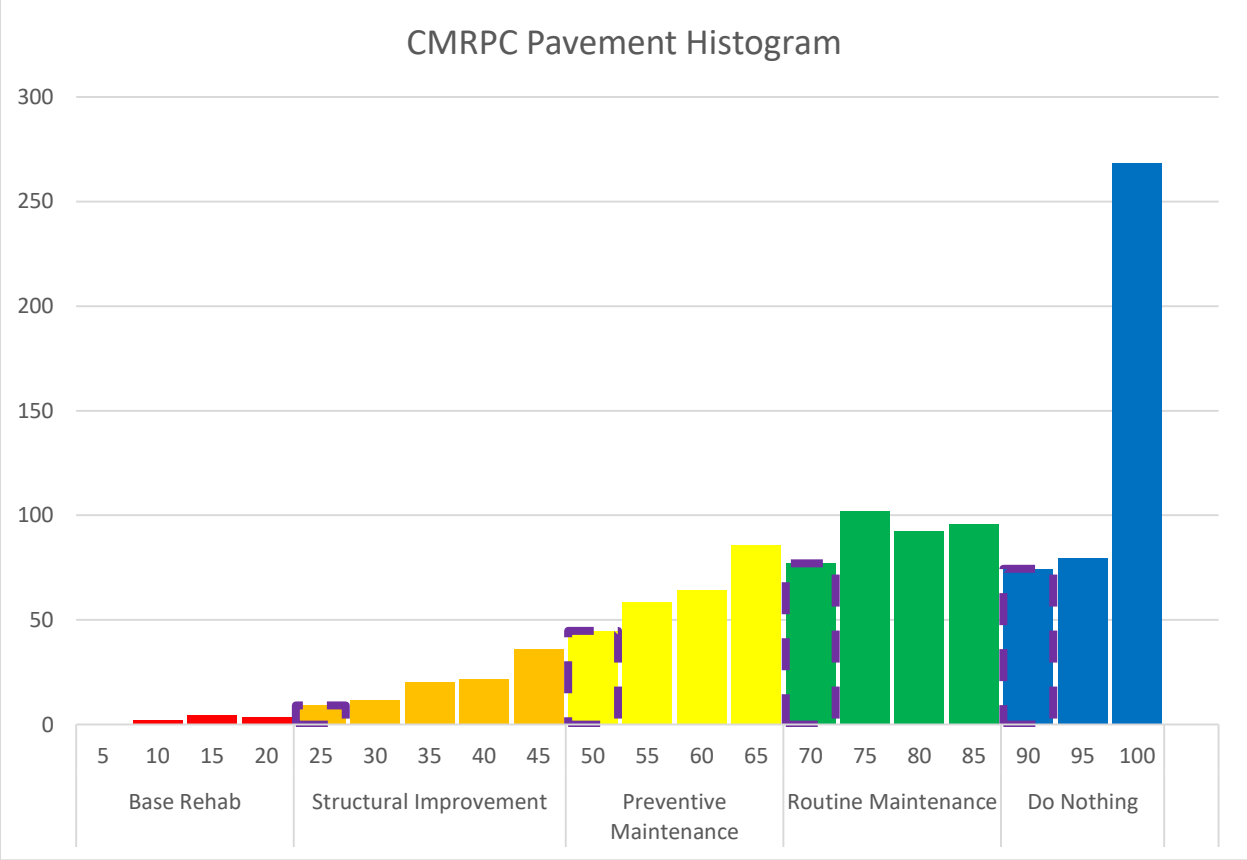
Our natural inclination is to prioritize road repairs according to a 'worst first' approach. However, as Figure IV-26 so clearly displays, a "worst first" approach requires a large portion of available funding. It costs 66 times more money to reconstruct a roadway than to perform routine roadway maintenance. If our approach only prioritizes the repair of the worst roads, our limited funding will not cover maintenance of roads in better condition. The result will increase overall costs to repair the entire network as road conditions continue to deteriorate and repair strategies become more intensive.

Figure IV-26: Cost Comparison of Pavement Repair Strategies

Since the different repair categories have different costs associated with them it is important to understand not only which repair category roadways fall into, but also which band they belong in. It is more cost effective to repair roads before they fall into a more expensive repair category.

Figure IV-27 shows the distribution of the CMRPC network condition in miles broken into OCI groupings. The groupings that are most in danger of falling into a more expensive repair category have been outlined and should be prioritized for repair.

Figure IV-27: CMMPO Pavement Histogram



In order for the region's network OCI to be maintained, additional funding must be allocated. Using Cartegraph it was determined that $38 million per year would be required to maintain an OCI in "good" condition for the federal-aid system. The region only receives $19.2 million annually in Chapter 90 funds. Many towns use their portion of the Chapter 90 allocation to maintain their entire road system. Since roads only requiring maintenance activities have a lower cost burden than structural improvement or base rehabilitation, it is important to prioritize the roadways that will need this type of treatment. The CMMPO staff developed a priority list using the principles that have been highlighted so far in this chapter.

Sidewalks and Curb Ramps

Since road repair projects largely compete for the same funding as sidewalks and curb ramps, it makes sense to prioritize them together. In addition, sidewalks, curb ramps and roads in disrepair should be prioritized. The identified "no ramp" locations in the region should also be included in the prioritization because they are the largest barrier to an inclusive network.

Bridges

Similar to roadways, bridges require regular routine maintenance to keep them in a state of good repair and to reduce their lifetime repair costs. In the CMMPO there are 51 identified bridges as “structurally deficient” with 19 located on the National Highway System. The CMMPO promotes the prioritization of repair and maintenance of all bridges in the region, the repair or replacement of any bridges in ‘structurally deficient’ condition on the National Highway System and the repair and replacement of any bridges in ‘structurally deficient condition’. Prioritization will be discussed in following chapters and areas for pavement, sidewalks, curb ramps and bridges will be identified.

Travel Demand Model

Background

The Regional Travel Demand Forecast Model is an important planning tool both for the evaluation of proposed regional transportation improvements and the projection of mobile source air emissions for significant regional projects. The model is the most effective and comprehensive way to project transportation needs within a twenty-year planning horizon as required by Federal regulation.

In the regional travel demand model, traffic volumes are forecast through the interaction of transportation demand and supply. Traffic zones are defined to encompass areas of development that represent the demand, while the actual road network represents the supply. A network is developed consisting of a series of points, or nodes, that graphically show locations of roadway intersections and other elements of the network. Connections between nodes are called links. Links represent highway segments and contain information such as speed and road capacity. Traffic zones contain demographic and employment information, and are represented by special nodes called centroids. Each zone is attached, or "loaded," onto the network by specialized links called centroid connectors.

Each traffic zone generates a level of person trips activity based on its land use. Information entered into the model for each zone (such as population, households, income and employment) determines the number of trips produced and/or attracted to that zone. Households are the primary producer of trips, while employment sites are the primary attractors. These productions and attractions are converted to person trips and distributed across the network. This trip distribution is a function of the travel time and attractiveness of a destination as compared to the travel time and attractiveness of all competing destinations. Following trip distribution, a mode choice model then defines the travel mode used for each trip. Travel mode selection is a function of mode accessibility, trip purpose, mode costs, household income, and trip length. Following mode choice, auto vehicle occupancy rates are applied to auto trips. Trips by other modes (walk, or transit) remain as person trips.

Performance Management

As discussed in Chapter II of this report, federal laws require performance based planning that supports its planning emphasis areas. The travel demand model is a tool used to assess the condition of the roadway network in terms of congestion (auto & truck) and greenhouse gas

(GHG) reduction. These two areas are included in FHWA Rule PM3. Similar to the congestion section, the following are the goals and objectives:

Goal 1 – Achieve a significant reduction in congestion on the National Highway System (PM3)

- A level of travel time reliability (LOTTR) on both Interstate and non-Interstate NHS that includes a ratio below 1.50 for all recorded time periods.
- A level of truck time reliability (TTTR) on Interstate NHS that includes a ratio below 1.85 for all recorded time periods.
- The target for Peak Hour Excessive Delay (PHED) per capita for the MA-NH and Worcester urbanized areas (UZA) is 18.31.
- Maintain a percentage of Non-Single Occupancy Vehicle Travel (SOV) below 35.46%.
- Emissions reductions of 1,622 CO and 497.9 Ozone.

Analysis

The regional travel demand model was used to generate the Daily Vehicle Miles Travelled, Total Congested Vehicle Miles Travelled, and Heavy Truck Vehicles Miles Travelled for the current "2018" and Future "2040" years. Table IV-20 below shows this comparison.

Table IV-20: Comparison of travel behavior Current vs. Future

	2018	2040	Percent Growth
Daily Vehicle Miles Travelled	13,532,797	15,644,006	16%
Total Congested Vehicle Miles Travelled	1,074,995	1,401,419	30%
Heavy Truck Vehicle Miles Travelled	2,170,972	2,364,334	9%

The above table shows that there will be an increase of about 16% of daily vehicle miles travelled, a 30% increase of total congested vehicle miles travelled, and an increase of 9% of heavy truck miles. Given the increase of the above VMT calculations, it is obvious that the congestion on the roadway network will only get worse in the year 2040. Please see Figure IV-28 which shows the comparison of congested locations for current and future conditions.

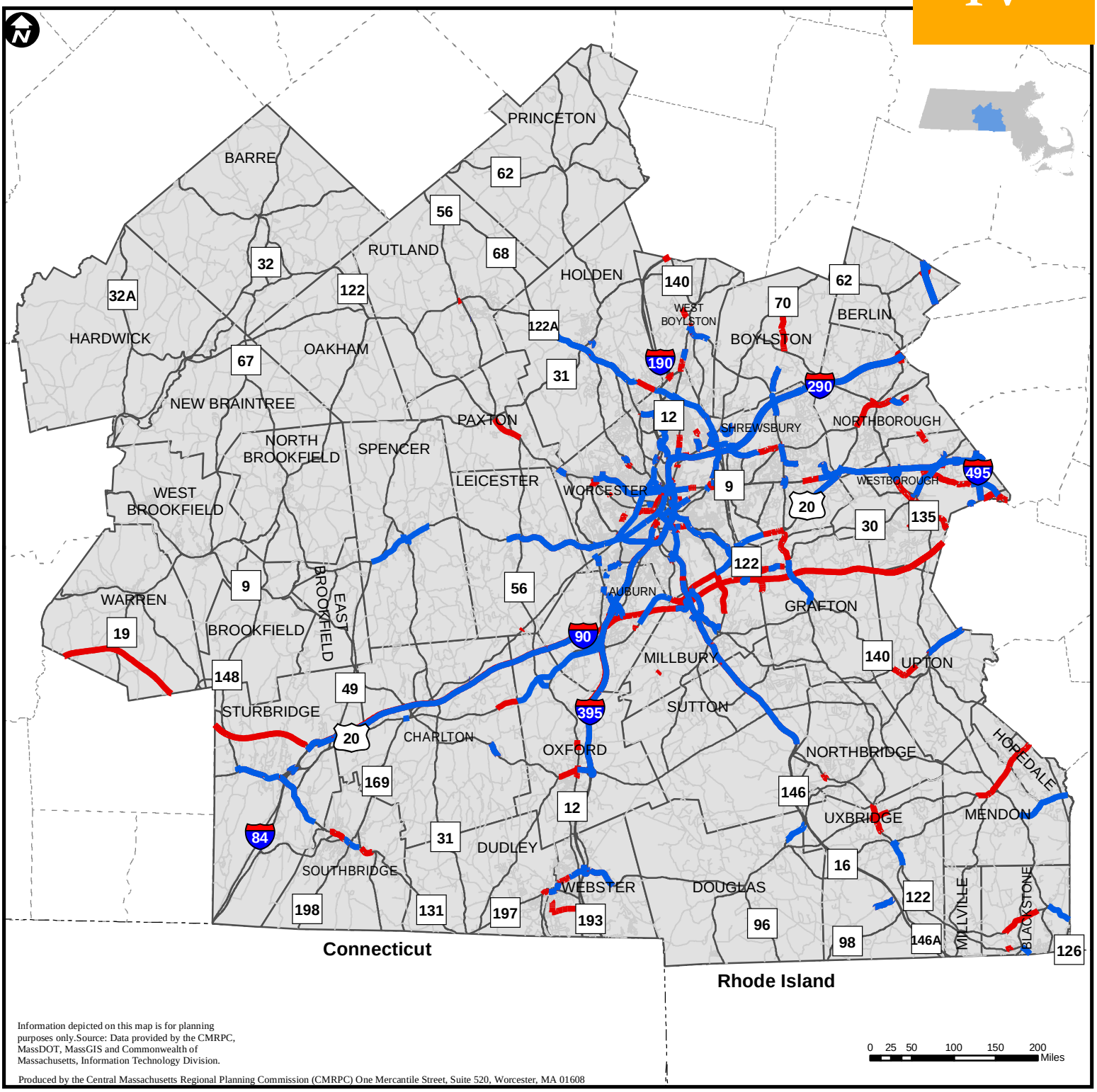


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Figure IV-28 Existing and Projected Congestion Locations

- Existing Congestion 2015
- Projected Congestion 2040
- CMRPCTowns

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Needs Assessment

Given the limited funding to expand the transportation system, there is a need to look at innovative ways to reduce congestion by looking more deeply at transportation demand management techniques. Transit, walking and bicycling are modes that can improve livability and public health. Some of the initiatives that could help alleviate congestion are investing in increasing and promoting transit use and investing in programs that reduce single occupancy vehicle use such as Park and Ride lots and expansion of sidewalks and bike lanes. Intelligent Transportation Systems can also be used for both recurring and non-recurring congestion like construction and accident delays.

Prioritization and Next Steps

Staff will continue maintaining its regional travel model by updating network and land use data, and will:

- develop model capabilities to measure key Performance Measure metrics developed as part to this Plan;
- generate model outputs to assist with TIP project scoring;
- analyze potential benefits of ramp metering on I-290 ramps. Use the Transmodeler micro-simulation to aid in the effort.
- Model potential and implemented WRTA service changes as requested, including changes recommended in the 2015 Comprehensive Service Analysis
- Improve the model's capability to more accurately reflect freight (truck) travel.
- Develop enhanced mode-specific performance measures that aid benefit and burden analysis for proposed projects, and
- Aid in the traffic management plan development during the construction of major regional projects.

Freight Movement: Highway Trucking & Railroads

Background

Freight movement in the planning region is anticipated to both increase and evolve. Existing intermodal activity will continue between highway and railroad freight. Freight movement has a direct relationship to regional economic vitality. Through connections to the national freight network, the ability of rural communities to access national and international trade markets is strengthened which, in turn, supports regional economic development. US DOT encourages multi-modal stakeholder advisory committees where necessary to help guide investment in infrastructure that is critical to the movement of freight. Within the planning region, this role is served by the CMMPO Advisory Committee.

National Efforts

Freight Performance Measures

The FHWA Office of Freight Management & Operations has developed performance measures for the nation's highway system through the **Freight Performance Measures (FPM) Initiative**. System performance measurement is considered valuable as various agencies at the national, state and local levels seek to monitor existing infrastructure, identify improvement needs and determine the costs and likely benefits of investments in the multimodal transportation network.

Freight system reliability is an important US DOT focus area. One element of the FPM initiative is a data processing tool that determines average operating speeds for trucks that travel on the Interstate Highway System. These averages are calculated using onboard data from several hundred thousand trucks. By accessing this system, transportation data analysts, researchers and other practitioners can determine where, when and how efficiently trucks are moving on selected Interstate highways.

Massachusetts Freight Planning Efforts

State Rail Plan

The CMMPO staff reviewed the "Draft Massachusetts State Rail Plan" document dated January 2018. The Plan listed a number of future year improvement projects that seek to address needs across the entire Commonwealth in a balanced fashion. In addition to planning ahead, the document also addresses the need to both fund and complete already underway rail projects, addressing "unfinished business". The renewed effort to complete

the stalled South Coast passenger rail project is anticipated to have far reaching benefits for the southeastern part of the state and is commended.

In particular, planned improvements to Boston's South Station are projected to have a range of benefits for the entire southern tier of the MBTA Commuter Rail network, including the Worcester line. Additionally, beyond the Plan document, staff looks forward to the results of the study and economic analysis that is also being conducting for the long-contemplated North-South Rail Link in Boston.

The State Rail Plan's documented intent to further investigate the implementation potential of the findings of the Northern New England Intercity Rail Initiative (NNEIRI) higher-speed passenger rail study is also broadly appreciated. Staff is aware of the ongoing efforts of our western regional neighbors at the Pioneer Valley Planning Commission (PVPC) that seek the passenger rail service to Boston that we in Central Massachusetts currently value.

State Freight Plan

The CMMPO staff reviewed the "Draft Massachusetts Freight Plan" dated November 2017. The Plan document targets specific actions, particularly significant trucking rest stop and permitting needs. The Plan also specifies the use of future year funding in a reasonably phased manner. Further, the document appears to be both concise and balanced.

As part of the development of the State Freight Plan, the CMMPO staff took an active role, as requested by MassDOT-OTP, in designating "Critical Rural & Urban Freight Corridors". This exercise defined both existing and new major freight routes in the region connecting to the National Highway System (NHS). These established routes, also endorsed by the CMMPO, are included in the finalized Plan document.

As requested by MassDOT-OTP, staff completed the process of identifying (reaffirming in many cases) primary freight routes throughout the region, delineating between those roadways in the urban and rural areas. As part of this exercise, the region needed to meet OTP-allocated mileage guidance criteria parameters for the planning region. A GIS layer and accompanying justification table were compiled. The designated Critical Rural & Urban Freight Corridors are shown on Figure IV-29**.**

Regional Freight Planning Efforts

Typically, the CMMPO does not directly influence the movement of freight within and through the greater region. The planning staff periodically informs the CMMPO of the range of challenges facing the providers of freight transportation, both highway and railroad. Reducing

congestion and increasing safety on the nation's primary freight routes are known US DOT focus areas. Regional planning efforts seek to minimize trucking delays as well as decrease crash incidents resulting in both fatalities and injuries. The planning staff has also conducted a series of multimodal community freight-hosting study efforts with both CSX (through the Regional Chamber of Commerce) as well as former area rail freight provider Providence & Worcester Railroad.

Performance Management

As discussed in Chapter II of this report, federal laws require performance based planning that supports its planning emphasis areas. Beside the federal performance measures, the CMMPO also have a number of regional goals and measures that are followed. In this section, goal 1 is related to PM3 (Congestion) and the emphasis area of Economic Vitality. Goal 2 is within the regional goal of Safety, while also considered part of PM1. The measures for these two goals are the following:

Goal 1 – Achieve a significant reduction in congestion on the National Highway System to improve truck reliability

- A Level of truck travel time reliability (TTTR) on Interstate NHS that includes a ratio below 1.85 for all recorded time periods.

Goal 2 – Reduce number and rate of fatal and serious injury crashes for large trucks/freight by 10% by 2040

- A 2040 target of 25.56 combined fatal and serious injury crashes for large trucks/freight.
- A 2040 target rate of .53 combined fatal and serious injury crash rate for large trucks/freight.

Analysis

Existing Conditions

The National Highway System

The region's part of the National Highway System (NHS) serves the major intermodal facilities that are the focus of ongoing freight planning efforts. Considered priority routes for the movement of freight, key segments of the NHS often provide connections between major Interstate highways and major intermodal terminals, particularly in the region's core within the city of Worcester.

NHS in Central Massachusetts

As stated by FHWA, the NHS consists of roadways important to the nation's economy, defense, and mobility. The NHS includes the following subsystems of roadways. *Please note that a specific highway route may be on more than one subsystem.*

- **Interstate:** The Eisenhower Interstate System of highways retains its separate identity within the NHS.
- **Other Principal Arterials:** These are highways in rural and urban areas which provide access between an arterial and a major port, airport, public transportation facility, or other intermodal transportation facility.
- **Strategic Highway Network (STRAHNET):** This is a network of highways which are important to nation's strategic defense policy and which provide defense access, continuity and emergency capabilities for defense purposes.
- **Major Strategic Highway Network Connectors:** These are highways which provide access between major military installations and highways which are part of the Strategic Highway Network.
- **Intermodal Connectors:** These highways provide access between major intermodal facilities and the other four subsystems making up the NHS.

The NHS was developed by the US DOT in cooperation with the states, local officials, and metropolitan planning organizations (MPOs). The National Highway System within the Central Massachusetts planning region is shown on Figure IV-29. As can be seen from the figure, the NHS includes all Interstate Highway and segments of US Route 20 as well as segments of Massachusetts State Numbered Routes 9, 16, 32, 49, 56, 62, 68, 122A, 131, 140, 146 and 169.

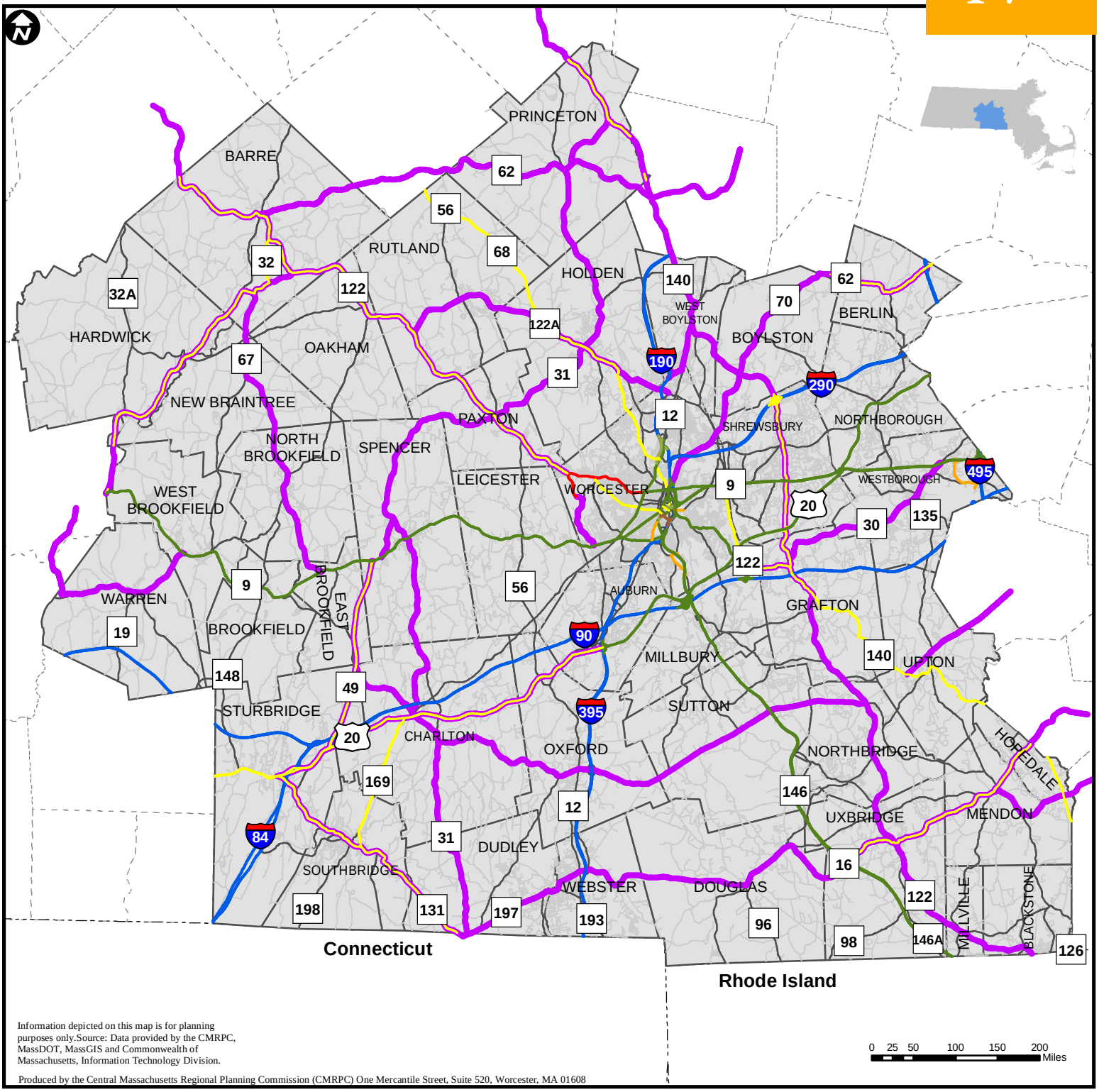

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Figure IV-29 National Highway System (NHS)

- Vital Transportation Links
- NHS - Interstate
- NHS - Major Airport
- NHS - Major Intercity Bus Terminal
- NHS - Major Rail/Truck terminal
- NHS - Other (not in above categories)
- NHS - Other - One-way pair
- NHS - Principal Arterial (MAP-21)
- CMRPCTowns

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National Highway Freight Network

Also shown in Figure IV-29, are the region's segments of the National Highway Freight Network (NHFN). The NHFN was established by FHWA, as required by the FAST Act national transportation legislation, to strategically direct federal resources and policies toward improved performance of various highway portions of the nation's freight transportation system.

The NHFN includes the following subsets of roadways:

- **Primary Highway Freight System (PHFS):** This is a network of highways identified as the most critical portions of the U.S. freight transportation system determined by measurable and objective national data. The network consists of 41,518 centerline miles, including 37,436 miles of Interstate and 4,082 miles of non-Interstate roads.
- **Other Interstate Portions not on the PHFS**: These highways consist of the remaining portion of Interstate roads not included in the PHFS. These routes provide continuity and access to freight transportation facilities. These portions amount to approximately 9,511 centerline miles of Interstate, nationwide, and will fluctuate with additions and deletions to the Interstate Highway System.
- **Critical Rural Freight Corridors (CRFCs):** These are public roads not in an urbanized area which provide access and connectivity to the PHFS and the Interstate System with other important ports, public transportation facilities or other intermodal freight facilities.
- **Critical Urban Freight Corridors (CUFCs):** These are public roads in urbanized areas which provide access and connectivity to the PHFS and the Interstate System with other important ports, public transportation facilities or other intermodal freight facilities.

The NHFN within the planning region includes segments of I-84, I-90 (MassPike), I-290, I-495 as well as segments of Massachusetts State Numbered Routes 9 and 146. Both CRFCs and CUFCs in the planning region were recently established by the CMMPO in 2017 and included as part of the Massachusetts Statewide Freight Plan. The CMRPC planning region's mileage allowance for both the rural and urban areas was based on criteria provided by MassDOT-OTP.

CMMPO-Established "Vital Links" of the Regional Highway Network

As part of previous LRTP development efforts, the CMMPO established and endorsed a number of goals and objectives, including the following:

- "Identify the most vital transportation links for the region so that *regional significance* can be better incorporated in the prioritization and selection of transportation improvement projects."

Accordingly, the established **"**Vital Links**"** of the planning region's highway network are also shown in Figure IV-29. All roadways designated as part of the FHWA established NHS were designated by the CMMPO as "Vital Links". Further, the following criteria were utilized by the CMMPO, assisted by CMRPC's Transportation Planning Committee (TPC), to identify additional Vital Links:

1. Is the roadway eligible to receive **federal-aid** funding through the TIP process?
2. What is the **functional classification** of the roadway?
3. Will the roadway enhance **overall connectivity** to the NHS?
4. Will the roadway provide connectivity to **major intermodal freight & passenger centers** not served by the NHS?
5. Is the roadway within or does it connect to roadways within the 2010 Census **Urbanized Area**?
6. Does the roadway enhance regional **mobility**? (North-South/East-West)
7. Are the **traffic volumes** significant within the area served by the roadway?
8. Are **Town Centers** connected to the overall network?
9. Are there **parallel facilities** that perform similar linkages, thus reducing the need to include duplicative facilities?

The established Vital Links are intended to assist the CMMPO in assessing *regional significance* in regards to TIP project screening, ranking, selection and eventual programming. Further, the CMMPO also indicated that the programming of federal-aid funding for projects on other federal-aid eligible roadways is *not* precluded by the established Vital Links network.

Inefficiencies to Movement of Highway Freight

Inefficiencies to the movement of freight along the region's highway network have been observed and documented within the planning region, as summarized below.

Low Bridge Structures

Older bridge infrastructure, some in excess of 100 years in age, lacks necessary vertical clearance for modern vehicles and associated equipment. There are a number of low bridges,

particularly on key routes in the town of Westborough and city of Worcester, as well as on other lesser traveled roadways in the planning region. When large trucks get inadvertently stuck beneath low bridges, quite often vehicle damage results, and there are traffic delays associated with clearance operations of the stuck and often disabled vehicles. Further, there are often impacts to surrounding businesses. Over-size vehicle detection equipment has been considered and installed at specific low bridge locations that have a history of clearance issues. Methods include enhanced warning signage, hanging barriers, and lasers which detect excess height vehicles.

Substandard Roadway Geometry

Tight turning radii exists at older highway interchanges and intersections, there are sharp curves where rollovers have a tendency to occur and other types of substandard roadway geometry. Modern chevron-style warning signs can be installed on identified high hazard roadway curves where rollovers have been documented. These signs can also be supplemented by selective vegetation removal. Further, High Friction Surface Treatments (HFST) should also be considered for sharp roadway curves with a significant crash history.

Freight Policy

Policy-related issues are formidable. They include local restrictions on delivery times, neighborhood commercial vehicle exclusions as well a lack of adequate commercial loading zones and truck parking & turning facilities, particularly in more urbanized areas. Ongoing planning efforts attempt to balance neighborhood preferences with the need to move goods.

Truck Parking

Truck parking issues exist on a wide basis in greater New England. Truck-oriented facilities are somewhat limited in comparison to other areas of the country. Truckers, who must follow federal safety laws requiring mandatory rest periods, need places to park, eat, sleep and bathe. As demand for goods is anticipated to remain high, the needs of the trucking community must to be addressed to ensure the continued safe flow of freight on the highway network.

Despite a range of challenges, MassDOT's ongoing efforts to install select Intelligent Transportation System (ITS) components statewide [including an All Electronic Tolling System (AETS) on the MassPike (I-90)] are anticipated to decrease identified inefficiencies of the highway network in the greater region. ITS will help to reduce delays in the movement of freight. Further, consolidated truck permitting for all of the New England states should be considered on the federal level so as to streamline highway freight movement in the geographically compact six-state region.

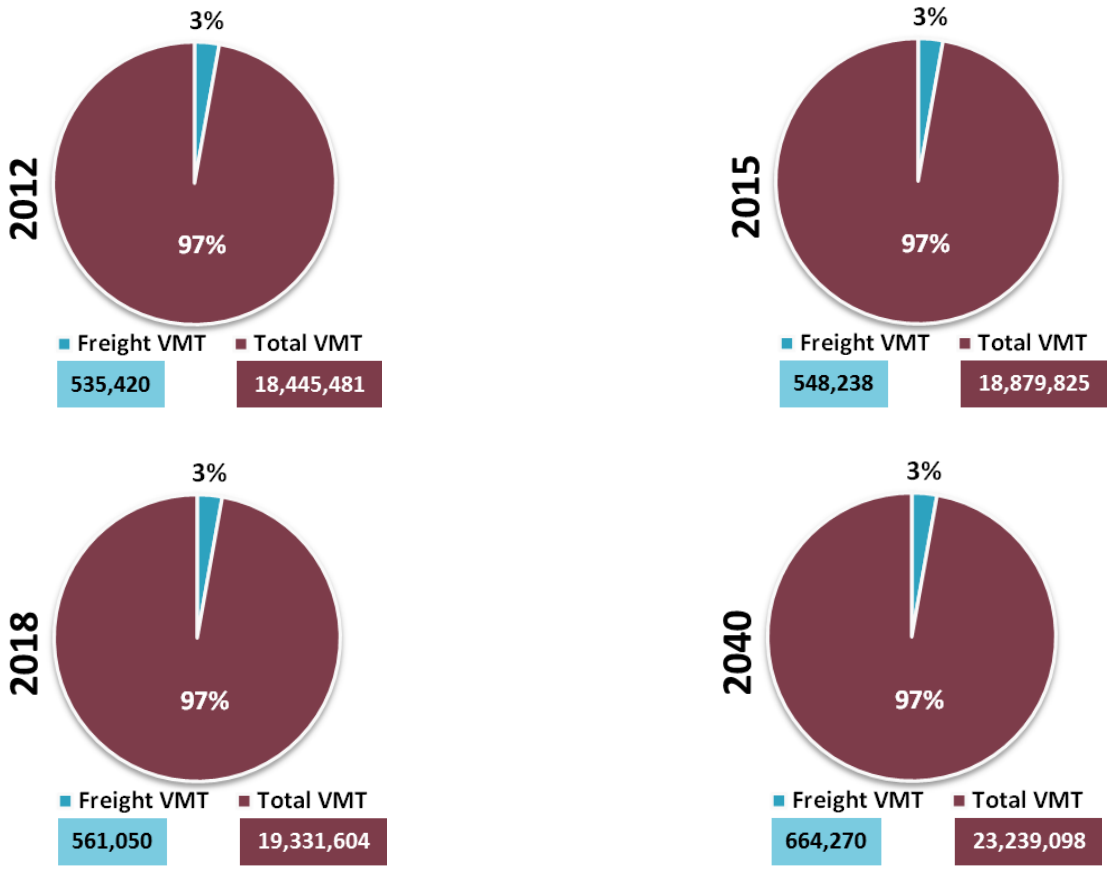
Trucking Activities in the Greater Region

Annual Vehicle Miles of Truck Travel

The CMMPO's Travel Demand Model estimates the distribution of truck trips on the region's roadway network. The model is a computer tool that estimates the generation of truck trips by geographically defined zones and their distribution on the region's roadway network. For the purposes of the LRTP, the model was used to study several different elements of truck travel within the region, most notably the number of vehicle-miles traveled (VMT) for trucks compared to overall VMT for all vehicle classifications.

The pie charts in Figure IV-30 reflect the VMT data derived from the Travel Demand Model for the years 2012, 2015, 2018 and projected for 2040. As VMT increases each year, the percent of truck VMT compared to the total amount of VMT has not changed and perhaps will not change as portrayed by the 2040 forecast.

Figure IV-30: Freight VMT vs Total VMT



Heavy Vehicle Volume Map

CMRPC conducts mechanical traffic counts on numerous federal-aid roadways within the Central Massachusetts region. These automatic traffic recorders (ATRs) can collect volume data, as well as vehicle classification data. The most current data available on the federal-aid roadways was used to compile Figure IV-31, the total heavy vehicle traffic volumes in the planning region. The thicker the red line, the higher number of heavy vehicles traveling on that road.

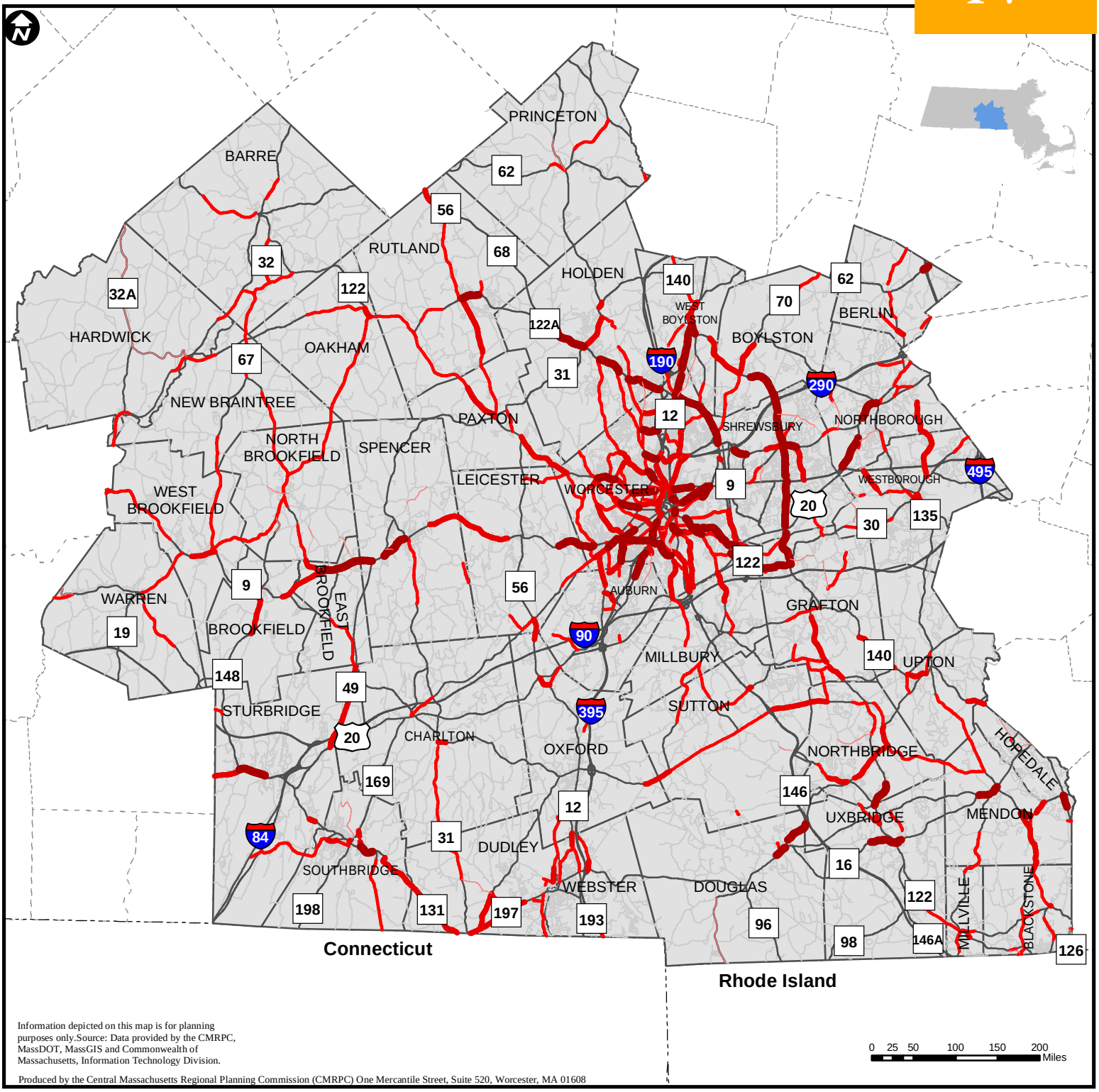


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Figure IV-31 Heavy Vehicle Traffic Volume Flows

11 - 100
101 - 500
501 - 1000
1001 -5000
CMRPCTowns

Mobility2040 Invest in Your Transportation Future
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Crashes at Rail-Grade Crossings

The planning region is a significant intermodal freight hub for both the state and greater New England. It is projected that trucking and railroad intermodal freight activity will continue to grow within the region. In addition, the current *Mobility2040* prioritizes several freight rail projects to improve the network efficiency. Some of these projects include improvements of at-grade railroad crossings owned by the Grafton & Upton Railroad and MassCentral Railroad.

The Federal Railroad Administration (FRA) maintains a Highway-Rail Crossing Inventory that identifies 321 railroad crossings in the CMMPO region. Of these, 198 are at-grade crossings (127 of which are public crossings), 53 railroad over-crossings and 80 railroad under-crossings. MassDOT's Highway Division administers federal funds set aside in Section 130 of the FAST Act to eliminate or mitigate hazards at public highway-rail grade crossings. The MassDOT Grade Crossing Program focuses on improving safety at existing highway-rail grade crossings primarily through the installation of protective devices.

As shown in Table IV-21, the FRA Railroad Accident/Incident Reporting System has recorded five reported cases in the period from 2010-2018 in the CMMPO region. All the crashes reported were due to drivers crossing the gate by mistake or distracted. No fatalities were reported during the period of 2010-2018.

Table IV-21: FRA Railroad Accident/Incident Reporting System: Crashes at Road/Rail Crossings in the CMMPO Region

Year	Town	Street	Railroad
2010	Berlin	West Street	CSX
2011	Worcester	McKeon Road	P&W
2012	Worcester	Thomas Street	P&W
2013	Auburn	Sword Street	P&W
2014	Webster	Main Street	P&W
2015	-	-	-
2016	Auburn	Sword Street	P&W
2017	-	-	-
2018	-	-	-

Data from the Federal Railroad Administration, Office of Safety Analysis: https://safetydata.fra.dot.gov

Crashes with Overhead Railroad Crossings

During the period of 2011-2016, there were a total of 69 crashes with overhead railroad bridges with a low-vertical clearance in the CMMPO region. Most of these crashes occurred during daylight hours and under dry roadway conditions. Almost all of the crashes involved a single vehicle travelling straight ahead, and most of the time, the severity reported was only property damage, with an exception of four (4) injury crashes.

Motor vehicle-railroad crashes occurred multiple times in a few locations. Worcester accounted for the highest number of crashes. The locations where these crashes occurred were Cambridge Street (17), Webster Street (9), Madison Street, Sunderland Road and Hammond Street with 4 crashes each, and one crash at Green Street. The number of crashes associated with the overhead bridge at Cambridge Street had actually decreased since the installation of the overhead chains that are intended to alert truck drivers of the low clearance ahead.

Besides the crashes in Worcester, the second location with the most frequent crashes was Saint Paul Street in Blackstone where 10 crashes occurred during the 2011-2016 period. The height of the G&W railway overpass is posted as 11'-8". Another location with a high number of crashes is the MBTA's overhead bridge on Route 30 (East Main Street) in Westborough, which accounted for 9 crashes during the same period. In Leicester, the 3 crashes occurred at Mill Street while in Sutton, 2 occurred at Providence Road. One crash each was recorded in Hopedale at Hopedale Street (2016), in Auburn at the Leicester Street/Rochdale Street intersection (2016), in Hardwick at Barre Road (2012) and in Spencer at Lyford Road (2013).

Truck Parking

National Coalition on Truck Parking

The US DOT views truck parking safety as a major challenge both currently and into the foreseeable future. The resulting impacts are felt nationally as well as locally in the Central Massachusetts planning region. Accordingly, FHWA Freight Management & Operations has been supportive of the efforts of the National Coalition on Truck Parking. Since 2015, the Coalition has engaged stakeholders from the public sector, transportation organizations, the freight industry and other groups to advance safe truck parking by:

- Collaborating nationally and among regions to identify opportunities & solutions for truck parking needs
- Sharing information on data and new analyses developed by stakeholders to understand needs and trends in truck parking

- Encouraging partnerships among stakeholders to implement solutions
- Identifying opportunities to use existing and new programs to support truck parking implementation

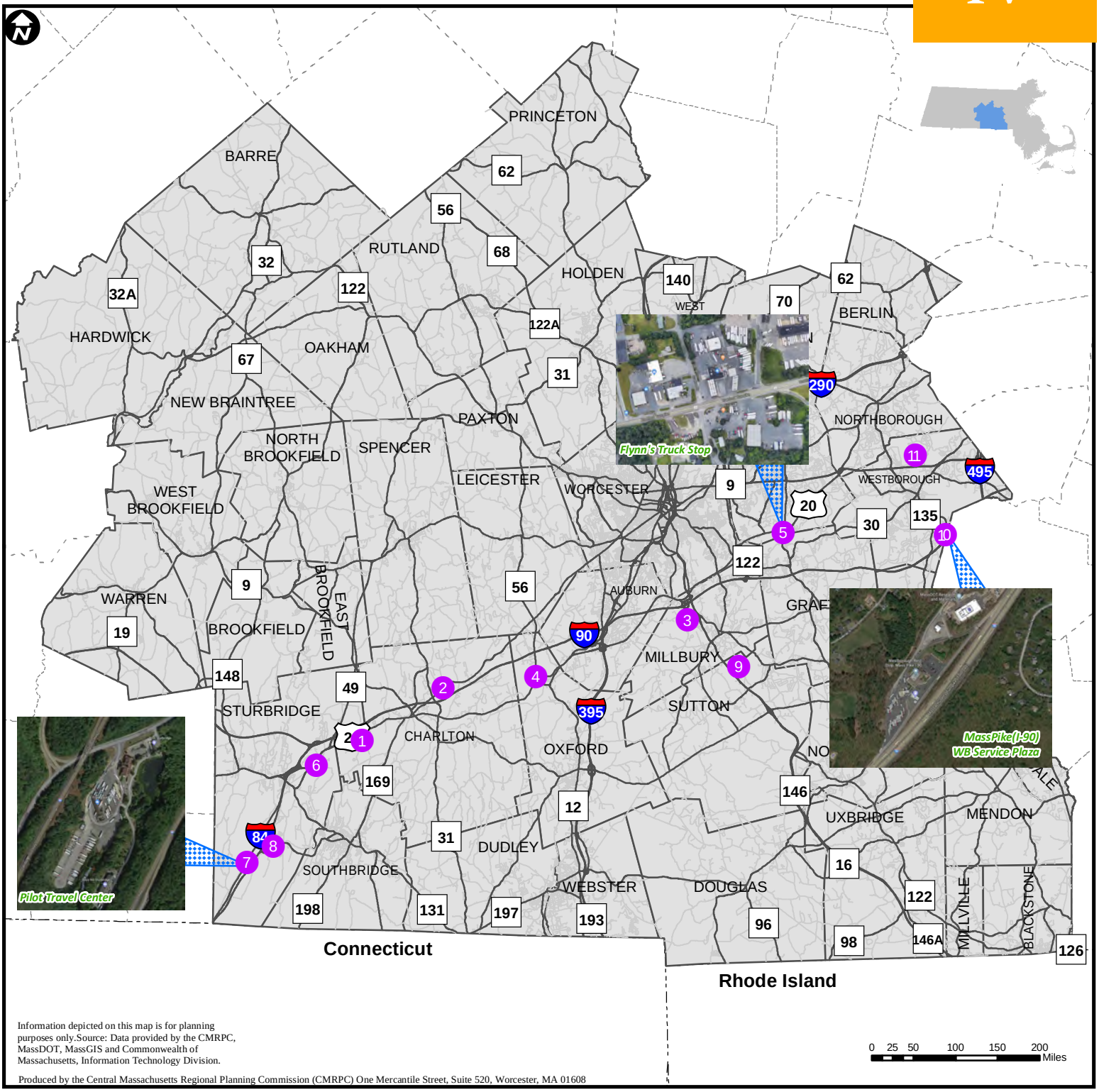
Presently, the Coalition is working to create strategies for various truck parking improvement initiatives related to parking capacity, technology & data, funding, finance & regulations as well as coordination with regional/local governments. *Visit the US DOT website at transportation.gov for more information on the nation-wide needs concerning truck parking safety.*

Rest Locations for Trucks in the Region

The transportation planning staff for the CMMPO conducted a preliminary inventory of major rest locations for long-distance truck drivers in the Central Massachusetts planning region. As shown in Table IV-22, staff compiled a summary of key aspects of eleven (11) major rest locations for long-distance truckers. The table includes such information as host community, rest location name, street address, available services – particularly the 24/7 availability of diesel fuel – the number of tractor & truck accommodating parking spaces as well as a telephone contact. Accompanying Figure IV-32 shows the respective locations of the eleven major rest locations for long-distance truck drivers including some aerial views.

Table IV-22: Major Rest Locations for Long-Distance Truck Drivers

#	Community	Name	Address	Available Services	Diesel Fuel Type	# of Truck Parking Spaces	Phone #
1	Charlton	Massachusetts Turnpike (I-90) Service Plaza	Eastbound Mile Marker 80	Store & Food	Gulf Diesel 24/7 (4 lanes)	8	508-248-4735
2	Charlton	Massachusetts Turnpike (I-90) Service Plaza	Westbound Mile Marker 83	Store & Food	Gulf Diesel 24/7 (4 lanes)	16	508-248-3308
3	Millbury	Xtra Fuels	100 Worcester-Providence Turnpike (Route 146 Southbound)	Store	Xtra Diesel 24/7 (2 lanes)	Minimal	508-581-9676
4	Oxford	Xtra Mart	93 Southbridge Road (US Route 20 west of Route 56)	Store & Food	Mobil Diesel 24/7 (2 lanes	Minimal	508-987-1431
5	Shrewsbury	Flynn's Truck Stop	307 Hartford Turnpike (Route 20 & Route 140)	Store, Food, Scale, Showers	Flynn's Diesel 24/7 (6 lane	300 (in 3 lots)	508-753-9698
6	Sturbridge	New England Truck Stop	201 Charlton Road (Route 20 east of MassPike (I-90)/I-84 Interchange	Store & Heavy Vehicle Repair	NO Diesel Fuel	35	508-347-7363
7	Sturbridge	Pilot Travel Center	400 Haynes Street (Old Route 15, I-84 Exit 1)	Store, Food, Scale, Showers	Pilot Diesel 24/7 (6 lanes)	250	508-347-9104
8	Sturbridge	Sturbridge Mobil	236 Haynes Street (Old Route 15, I-84 Exit 1)	Store & Propane	Mobil Diesel 24/7 (2 lanes	6	508-347-5792
9	Sutton	Xtra Mart	27 Worcester-Providence Turnpike (Route 146 Northbound)	Store & Food	Xtra Diesel 24/7 (2 lanes)	Minimal	508-865-3084
10	Westborough	Massachusetts Turnpike (I-90) Service Plaza	Westbound Mile Marker 104.4	Store & Food	Gulf Diesel 24/7 (4 lanes)	36	508-366-4841
11	Westborough	Xtra Mart (Mobil)	183 Boston-Worcester Turnpike (Route 9, 3 miles west of I-495)	Store	Global Diesel 24/7 (2 lanes	Minimal	508-366-1708



Information depicted on this map is for planning purposes only.Source: Data provided by the CMRPC, MassDOT, MassGIS and Commonwealth of Massachusetts, Information Technology Division.

Produced by the Central Massachusetts Regional Planning Commission (CMRPC) One Mercantile Street, Suite 520, Worcester, MA 01608

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Figure IV-32 Major Rest Locations For Long-Distance Truck Drivers

5 Rest Locations

CMRPCTowns

Mobility2040 Invest in Your Transportation Future The Update for 2020

Freight Railroad Providers & Intermodal Facilities

This section of Mobility2040 Update 2020 provides an overview of the freight rail transportation providers operating in the greater region. Six railroads are active in the planning region. General information concerning each is provided. One, the North Brookfield Railroad, may perhaps be resurrected from a nearly 50-year dormancy.

- CSX
- East Brookfield & Spencer Railroad
- Grafton & Upton Railroad
- MassCentral Railroad
- North Brookfield Railroad
- Pan Am Railways
- Genesee & Wyoming Inc., *(new owner of Providence & Worcester Railroad, 2017)*

Central Massachusetts is a significant freight intermodal hub for the state of Massachusetts and the greater New England region. Accordingly**,** there are ten (10) major intermodal facilities operating throughout the planning region, serving both freight and passengers. In order to determine how each intermodal facility is evolving, the transportation staff of the CMMMPO conducts periodic site visits and reviews other reference materials. Staff observations have shown that each site continues to operate while each has implemented various improvements to address present and projected future needs. Site improvements noted in the field include expansion, modernization, the construction of buffers shielding site operations as well as improved equipment & operations. A map of railroads and major intermodal facilities in the planning region is shown in Figure IV-33.

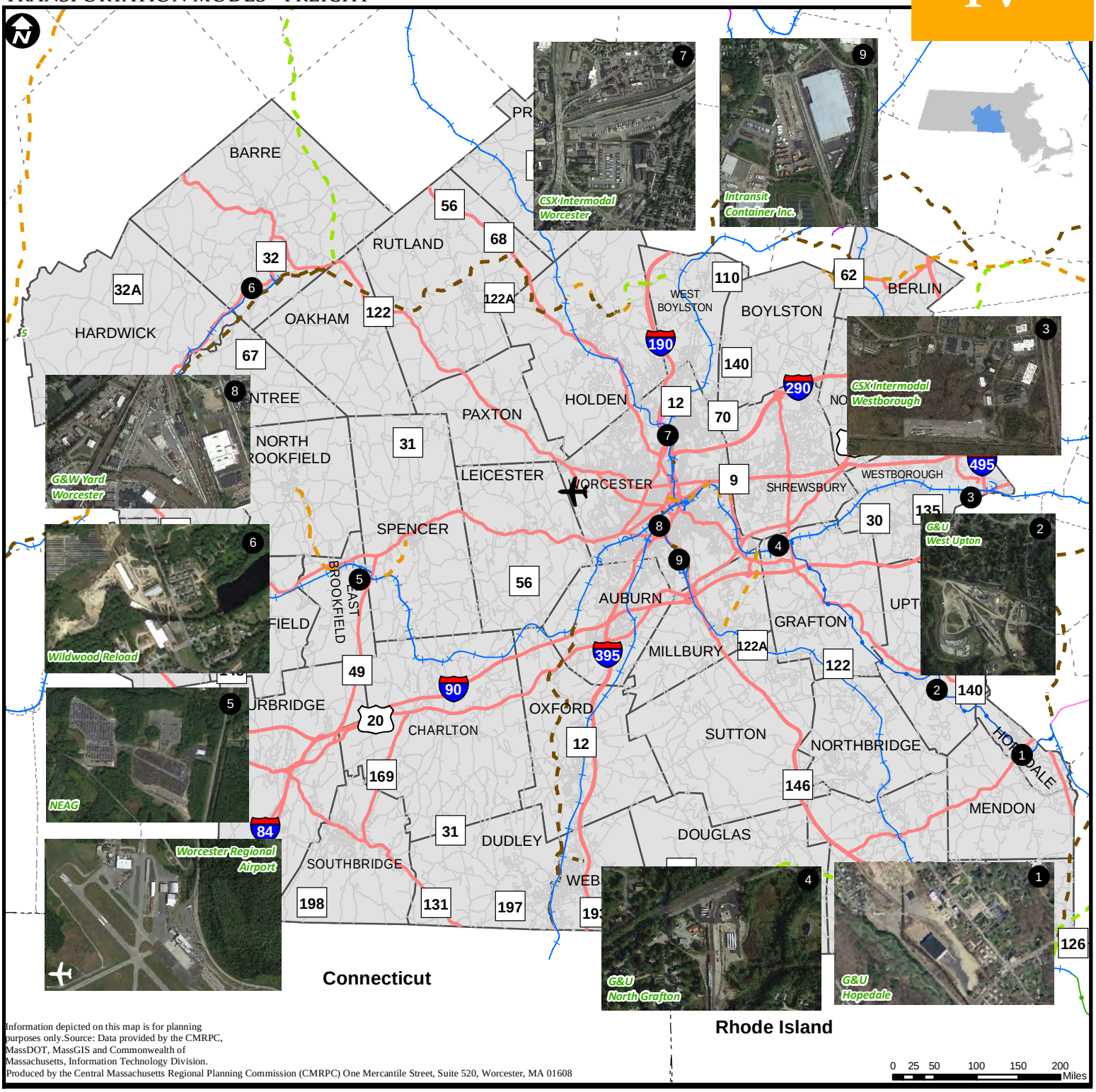

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Figure IV-33 Railroads and Major Intermodal Facilities

Rail Lines
- Active
- Multiple Use, Active & Recreational
- Recreation
- Out of Service
- Unknown Status
- Abandoned
- Abandoned, Right of Way in Public Ownership

- Airport Locations
- intermodal Freight Yards
- National Highway Syste,
- CMRPCTowns

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CSX

CSX is a major railroad serving the eastern US with a system that stretches from Massachusetts to Florida, west to Chicago, and south along the Mississippi River to New Orleans. CSX operations in Massachusetts feature full Phase II double stack container freight clearances on the Boston Line from the New York state line to Westborough. Within the past decade, CSX expanded and modernized the Worcester Intermodal Facility located along Franklin Street at a cost of over $100 million. The Worcester facility mainly handles domestic containers and trailers on flatcar. Similarly, in nearby Westborough, another long-established intermodal freight yard that currently handles bulk materials transloading was also improved. Freight handled in Westborough includes corn syrup, chemicals, pellets and other commodities. Economic activity in the greater region is generated and supported from the presence of both modernized CSX yards. "Last mile" distribution services are handled by the trucking industry.

East Brookfield & Spencer Railroad

East Brookfield & Spencer Railroad (EB&S RR) serves as the switching railroad for the New England Automotive Gateway (NEAG) located in the namesake host communities. The site was initially developed and incrementally expanded as a major automotive rail-to-truck transload facility serving all of southern New England. As such, a range of internal site improvements as well as off-site mitigation measures have been implemented over time.

At the NEAG, CSX trains carrying 80-100 railcars arrive each day. The EB&S RR works to unload the railcars and ready them for the return trip to automotive plants in the nation's heartland. CSX locomotives are now left at the NEAG so the EB&S RR can use them to switch the trains in and out of the site. The trucking industry, using highway automotive carriers, completes the "last-mile" delivery of the finished vehicles throughout the greater southern New England area. Deliveries are completed by a number of trucking companies that serve the NEAG site.

Phase II clearance improvements along the CSX Boston Line allow for "AutoMax" railcars to serve the site, increasing capacity. Additionally, company Diversified Trucking operates and maintains a rest facility on the site of the NEAG. Highway truck tractors and trailers can be repaired while drivers can rest.

Grafton & Upton Railroad

The Grafton & Upton Railroad (G&U RR) is a shortline railroad operating in the region that serves line side industry as well as a substantial intermodal transload operation. Most switching and transloading activities occur at the G&U RR yards located in the host

communities of North Grafton, West Upton and Hopedale. In Hopedale, the G&U RR operates adjacent to the Draper Mill complex, a candidate for potential future redevelopment.

Since the revitalization of the G&U RR, activity has steadily increased along the length of the G&U RR line. Following the resolution of litigation with the host community of Grafton, the railroad is currently operating a new propane transfer facility in North Grafton. Other efforts by the G&U include work to reestablish a severed rail connection to CSX in Milford. This would allow the railroad to transfer freight with CSX both in Milford as well as North Grafton. At this time, ongoing freight yard improvements are occurring in both Hopedale and West Upton. Recently, the G&U constructed a pair of fly ash silos within the railroad's Hopedale railyard.

MassCentral Railroad

Rural carrier MassCentral Railroad (MC) operates in the Ware River Valley between Palmer and South Barre over trackage largely owned by the Commonwealth. In Palmer the MC interchanges with both CSX and the New England Central Railroad. Various rail-related activities continue at the South Barre industrial park known as Phoenix Plaza. Phoenix Plaza Industrial Park is located at the site of the former Barre Woolen Mill. This facility allows for convenient last mile delivery in this rural part of the planning region.

North Brookfield Railroad

The North Brookfield Railroad (NBRR), long dormant but never abandoned, continues to investigate the potential of restoring track infrastructure and reestablishing operations in its namesake community. The NBRR is viewed as the resurrection of a community-owned rail line dormant since the 1970's. The line is actually owned by the namesake host community of North Brookfield, and to this day the local Board of Selectmen acts as the railroad's board of directors. The line runs from an interchange with CSX in the adjacent town of East Brookfield north to the center of the town of North Brookfield.

In order to generate railcar traffic, a number of line side industries are envisioned. As an example, perhaps a paving stone manufacturer located along the line's right-of-way would one day reinstitute rail service. As part of the rail line's envisioned restoration, a significant at-grade highway crossing over Route 9 in East Brookfield will need to be reestablished.

Pan Am Railways

Pan Am Railways (PAR) is North America's largest regional railroad system. PAR's routes stretch from Saint John, New Brunswick to New York's Capital District.

PAR consists of the Springfield Terminal (ST) and Pan Am Southern (PAS). A haulage agreement with the Irving family of railroads extends ST's reach into Northern Maine and New Brunswick. The combined system, including haulage rights, totals approximately 1,700 route-miles. PAR's connections include all four eastern Class I systems (CN, CP, CSX, NS) as well as over 20 regional and short line railroads. Primary commodities handled include grain, coal, sand and gravel, food products, lumber, paper and pulp, chemicals and plastics, petroleum, processed minerals, metals, scrap metal, finished automobiles and intermodal trailers and containers.

Through a cooperative venture with eastern rail giant Norfolk Southern (NS), the "Pan Am Southern Patriot Corridor" was formed a number of years ago. The corridor runs from Mechanicville, New York to Ayer, MA and also includes restored trackage along the Connecticut River Line. Pan Am Southern (PAS) interchanges traffic with the Genesee & Wyoming Inc's Providence & Worcester Railroad in Gardner, MA in the Montachusett planning region. In turn, PAS interchanges with Norfolk Southern in New York State.

NS, similar to CSX, maintains a rail network serving the eastern US from the Atlantic Ocean to the Mississippi River. On the national level, NS and CSX compete toe-to-toe in order to serve the major customers of rail freight. Accordingly, the greater Central Massachusetts region has direct access to both major eastern carriers, which often leads to competitive shipping rates.

Along the PAS line in the northwest corner of Massachusetts is the Hoosac Tunnel, 5 miles in length. Engineering studies were previously conducted to determine the effort necessary to undertake a project to increase clearances in the tunnel to accommodate full "Phase 2" double stack service. Preliminary estimates indicate an investment of up to $50 million. Should the envisioned improvements ever be undertaken and completed, double stack trains from the west could be interchanged in Gardner and then proceed to Worcester on the G&W. Efforts to increase clearance in the tunnel are, however, appear dormant at this time.

Genesee & Wyoming Incorporated

As indicated on the company website, for much of its first century, Genesee & Wyoming was a 14-mile railroad serving a single customer in upstate New York. The company has since grown to be a leading owner and operator of shortline and regional freight railroads with 15,000 miles of track in five countries. G&W Incorporated (G&W Inc.) owns or leases 122 freight railroads worldwide organized in nine locally-managed operating regions with 8,000 employees serving 3,000 customers. G&W's seven North American regions serve 41 U.S. states and four Canadian provinces and include 115 short line and regional freight railroads with more than 13,000 track-miles.

G&W railroad's success depends on providing superior service to customers. They value their customer's business above all else, and pay close attention to improving service every day, in every region.

- G&W railroads serve 3,000 customers worldwide in six languages to best meet the needs for world-class rail transportation services.
- Staff is well-educated and trained to meet job requirements, with the capacity to deal with almost any situation. Regionally-based management teams apply best practices to conduct business with personalized involvement and a commitment to strong relationships with local customers and communities.
- G&W subsidiaries and joint ventures also provide rail service at more than 40 major ports, rail-ferry service between the U.S. Southeast and Mexico, transload services, contract coal loading and railcar switching and repair.

In the future, various G&W lines in the greater region may need to be cleared in order to accommodate full Phase 2 double stack container service, increasing system capacity. As an example, the G&W may determine the future need to implement clearance increases on the carrier's line between Worcester and Gardner known as the Gardner Branch. In Gardner, the G&W interchanges with Pan Am Southern (PAS). Elsewhere on the G&W rail network, modest improvements are anticipated to be ongoing, such as the repair, replacement or installation of mainline track, interlockings and customer switches & rail sidings. Bridge strengthening efforts would perhaps be anticipated to upgrade 263K rated structures up to the industry-standard 286K. As an example, G&W bridge structures in the Blackstone Valley may require strengthening or replacement to gain the desired 286K load rating.

Sale of the P&W Railroad: Staff monitored news from various media outlets concerning the proposed, pending and eventual STB-approved sale of Worcester-headquartered Providence & Worcester Railroad to buyer Genesee & Wyoming (G&W) Incorporated. This purchase absorbed P&W tracks into a larger New England system of railroads already owned by the G&W. The CMRPC hosted the last P&W shareholder's meeting in late October 2016. During December 2016, following STB approval, new owner Genesee & Wyoming Rail Services Inc. took over operations of the P&W, officially absorbing the carrier into their system of railroads. Long term employees were terminated and new management was placed in control.

BRV Regional Freight Rail Planning Study & Feasibility Analysis 2020: In early 2017, the CMMPO staff completed the "Blackstone Valley Regional Freight Rail Planning Study & Feasibility Analysis" Project Summary and accompanying technical appendices. This effort, kicked-off by the agency's Community Development and Planning (CDAP) staff in 2015, is

available on the CMRPC website. The study process included hosting three major public outreach meetings, conducting numerous host community meetings as well as site visits in each of the participating towns. *(The completed study was provided to MassDOT OTP and subsequently used as a reference in the compilation of both the Statewide Railroad & Freight plans.)*

Concise in nature, the completed Study's project summary contains an overview, methodology, and overall findings along with a listing of conclusions and recommendations. The study includes materials customized to each participating Valley community: Grafton, Millbury, Millville, Sutton and Uxbridge. Extensive accompanying technical appendix materials cover five major components of the area-wide study:

1. Best Practices
2. Host Community and Industry Detail Sheets
3. Stakeholder Outreach
4. Enhancing Municipal Planning, and
5. Management System Community Profiles

The Management System Community Profiles summarize a broad range of materials including traffic counts, truck volume percentages, congestion, pavement, safety and multi-modal information.

Intransit Container Incorporated

Intransit Container Incorporated (ICI) operates the Wiser Avenue intermodal container yard in the city of Worcester. The ICI facility is served by G&W Inc. ICI's focus is international container traffic from around the globe. The site is a customs-bonded, inland port. In the past few years, yard expansion at the Wiser Avenue site was completed along with a number of internal improvements. These include an attractive wall shielding site operations and reducing noise and lighting spillover. In addition to more space for container and chassis storage, the Wiser Avenue yard now also boasts improved lift maneuverability, speeding operations.

Needs Assessment

Various improvements to the multimodal transportation infrastructure in the greater region that could enhance freight movement over the network have been identified. These improvements range from the restoration of existing infrastructure, to new construction, to the deployment of various technologies. The "freight system" is viewed to consist of the region's network of major highways and railroads. Planning efforts often focus on the region's previously identified, National Highway System (NHS) urban & rural freight routes serving major

intermodal facilities, particularly in the region's core. Further, attention is also given to the major federal-aid roadways serving the region's rural areas that are also important to the movement of freight.

Highway

Stakeholder Outreach

A number of comments and suggestions concerning the movement of freight on the region's highways were documented as a result of the extensive public outreach effort conducted for the LRTP update. The following provides a summary of some of the more pertinent remarks.

- MassDOT Highway Division District #3: District staff has been focused on addressing existing, recurring congestion on the region's Interstate System. Two critical locations within in the planning region that experience chronic congestion are:

  1. I-495 southbound to I-290 westbound, *Berlin/Hudson/Marlborough*. Long-anticipated I-290/I-495 interchange improvements, conceptual in design, may perhaps have the ability to move forward in some phased manner.

  2. MassPike (I-90) between I-84 and I-290, *Sturbridge/Charlton/Oxford/Auburn*. This heavily traveled section of I-90 experiences chronic congestion and numerous vehicle crashes, many involving large trucks. Potential geometric improvements to interchange ramps may be considered in the future. Further, it is suggested to investigate the feasibility of additional High Occupancy Vehicle (HOV) lanes along this critical segment of I-90.

  MassDOT completed the process of replacing the MassPike (I-90) cash and electronic EZ Pass toll collection systems with a new system of All Electronic Tolling (AET). With the removal of the old toll booth infrastructure, the delays encountered by both passenger vehicles and trucks have been substantially reduced at a number of MassPike interchanges, including those in the planning region.

- Discussions with a stakeholder from the town of Rutland highlighted Route 68's capacity for traffic volume growth, as this highway already serves as a direct link from Holden and Rutland north to Gardner and Route 2 in the Montachusett region. Also, the importance of existing Routes 9, 122 and 122A in both the north and west planning subregions was also noted. *(See Technical Appendix, "LRTP Futures")*
- CMMPO staff recollected that a number of years ago there was the potential opportunity to study Route 67 in the host communities of North Brookfield, New Braintree and Barre.

This study was never pursued at that time but perhaps could be considered for a future year study.

- Intersection of Route 9 with Route 49: Local stakeholders acknowledge and appreciate pavement markings limiting the eastbound Route 9 approach to a single lane. It was asked that the *same treatment be applied to Route 9 westbound* at this location as well**.** Perhaps the number of reported vehicle crashes could be reduced if Route 9 westbound were reduced to one travel lane in the future.

  This was suggested after observing in the field that when one turns left from the Route 49 northbound "Stop" sign to travel on Route 9 westbound, through volumes on westbound Route 9 are using the two through travel lanes that are provided. Often speeds appear to be in excess of 50 MPH for the short segment of Route 9 through the channelized intersection area of the Route 49 terminus. Further, the two through lanes seem to encourage speeding and potentially dangerous merging in the vicinity of Klem's retail store.

  In addition, rather than the installation of signalized control at this location, perhaps the significant land area of the existing Route 9/Route 49 channelized intersection could be used to construct a modern roundabout. A modern roundabout at this location would serve to calm travel speeds as well as avoid the ongoing electrical costs of signalized traffic control.

- It was raised at the Quarterly Meeting of the CMRPC held November 2018 that Central Turnpike in the town of Sutton needs to be resurfaced. It was pointed out that improvements to this corridor had been implemented in both the towns of Northbridge, to the east, as well as Oxford, to the west. Various segments of Central Turnpike through the town of Sutton should be considered for a future year improvement project. Some sections exhibit severe pavement deterioration. *(The CMMPO staff had indicated that a locally-customized "TIP Development" meeting could be scheduled with Sutton officials.)*

Highway Improvement Resources

There are a number of potential funding resources available to MassDOT that could be used to implement future year improvement projects at a number of identified locations throughout the planning region.

- Interstate Maintenance Program: The 1991 Intermodal Surface Transportation Efficiency Act (ISTEA) established a new Interstate Maintenance (IM) program and a separate National Highway System (NHS) program which includes the Interstate System. The IM

funds may be used on the Interstate System for 3R work (resurfacing, restoration, and rehabilitation) and for reconstruction of bridges, interchanges and overcrossings along existing Interstate routes. However, program funding may not be used for the construction of new travel lanes other than High Occupancy Vehicle (HOV) lanes or auxiliary lanes. The 1998 Transportation Equity Act for the 21st Century (TEA-21) expanded eligibility for funding under the IM program for reconstruction. As a result, the addition of new interchanges, new rest areas, new noise attenuation walls, etc. became eligible for IM funding.

In the greater region, future Interstate highway and NHS interchange reconstruction is anticipated in the future at the following locations:

- I-290/I-495, *Berlin/Hudson/Marlborough*
- I-495/Route 9, *Westborough*
- MassPike (I-90)/I-495, *Westborough/Hopkinton*
- I-290 Interchange 13/Route 122A (Vernon Street), *Worcester*
- Route 9/Route 20, *Shrewsbury/Northborough*

The infrastructure needs of the trucking industry that serves both commercial and manufacturing businesses in the greater region must be accounted for early in the planning process.

- Environmental Protection Agency "SmartWay" Program: The US Environmental Protection Agency's (EPA) SmartWay Program encompasses a range of efforts aimed at boosting fuel efficiency in business enterprise while reducing emissions that degrade air quality. One sector targeted by SmartWay is the nation's trucking industry. The EPA website, in addition to providing program highlights, displays many links to a range of SmartWay resources including finance programs, shipper and carrier/logistics-oriented materials and strategies, sample partner profiles and case studies. Further, SmartWay outreach materials are also available that address various environmentally-sound practices that could be adopted along with the potential savings that could be realized.
- CMMPO Transportation Improvement Program (TIP): An implementation option for highway-related improvement projects is the annual Transportation Improvement Program (TIP) administered by the CMMPO. The CMMPO is the transportation policy and project selection body for the planning region. Each year, eligible projects are selected for programming within the federal-aid funding targets provided by MassDOT-OTP. The TIP must be financially constrained for each of the listing's five fiscal years. The TIP includes roadway, bridge, intermodal and bicycle & pedestrian projects. Eligible TIP

projects are also screened, prioritized and selected using both federally-required and locally-customized Performance Measures. Performance-Based Planning & Programming (PBP&P) seeks to maximize the return on investments made in the region's multi-modal transportation network.

Railroad

In general, opportunities for improvement and expansion of the rail system in the greater region were considered broadly, inclusive of various efforts both large and small. Focusing on the major intermodal facilities located throughout the region, some identified opportunities are Worcester-centric while others pertain to other host communities in the region where highway/railroad intermodal transload facilities at located.

Stakeholder Outreach

A number of comments and suggestions concerning the movement of freight on the greater region's railroad network were documented as a result of the extensive public outreach effort conducted for the LRTP update. The following provides a summary of some of the more pertinent remarks.

- ***Freight Rail Network Resiliency:*** One major challenge voiced by a rail freight stakeholder is keeping the flow of petroleum products moving. Recent hurricane activity led to major unit train diversions in attempts to maintain fuel supplies desperately needed in storm-ravaged areas in the eastern and southern US.
- ***CSX:*** There may be the potential for rail giant CSX to shed lines in Massachusetts - perhaps the Boston Line and the Fitchburg Branch - potential assets that, in the past, have sparked attention from private investors. The interest in track acquisition may "heat up" again in the future. Both domestic and foreign-based investors may decide to go forward, delay or dismiss various possible rail line acquisitions.
- ***East Brookfield & Spencer Railroad:*** Management continuously seeking improvements to site operations and safety. Always looking to the future asking "In what direction are the major auto & truck manufacturers going? What types of finished roadway vehicles will be handled in the future?" An example of this is the manufacture of fewer cars and more SUVs as is currently the case. Also, within the past few years, EB&S operations were adversely impacted by fluctuating CSX train handling procedures. "How might operations and procedures fluctuate in the future?"
- ***North Brookfield Railroad:*** Potential future resurrection of NB RR along with attracting and siting major customers that require rail transportation services for the movement of

both raw materials and finished products. Federal law requires CSX to connect track, drop and retrieve railcars from the resurrected NB RR. Also, how will train delivery windows to the nearby New England Automotive Gateway (NEAG) be impacted should the NB RR be rebuilt and become active again?

Regional Strategies to Improve Highway Freight Movement

In order to reduce the local impacts from expanded freight capability in the Central Massachusetts planning region, the following suggested improvement options were compiled as part of ongoing freight planning activities. The options are provided for further consideration by host communities, intermodal facility operators, area freight transportation providers, and the CMMPO.

- Prohibit on-street vehicle parking adjacent to and across from intermodal facility site drives.
- Keep site drive areas clear of all obstacles such as large signs, street furniture, utility poles and overgrown vegetation.
- Provide adequate truck turning radii at major intersections, optimally to fully accommodate the movement of 53 foot international intermodal containers.
- Maintain and resurface roadway pavement surfaces as deemed appropriate.
- Maintain all traffic control signs, signals and pavement markings.
- Consider identification and designation of "Preferred Truck Routes" throughout the greater region.
- Potential "Truck Routing" Assessment: Originally suggested by the Worcester Regional Mobility Study (WRMS) as a future effort, this proposed regional study would identify "Preferred Truck Routes", identified bottlenecks to avoid, residential areas to avoid, low bridge clearances and other impediments to the efficient movement of freight. Pertinent examples in the city Worcester include the low bridge on Cambridge Street as well as periodic flooding on Southbridge Street.
- Supplemental Guide Sign Plan: Improve "wayfarer" or "trail blazing" on I-290 to/from Worcester's major truck-rail intermodal yards. This includes the CSX Franklin Street yard, G&W's Southbridge Street yard and Intransit Container's (ICI) Wiser Avenue yard.

Site-Specific Mitigation for Multimodal Freight Terminals

In order to reduce the local impacts from expanded freight capacity, the following suggested *site-specific* mitigation options for multi-modal freight terminals were compiled based on

various examples found in the greater region. They are included for the consideration of host communities and intermodal facility operators.

- Install noise attenuation walls and/or earthen berms to reduce noise while also shielding site operations.
- Use vegetation and other plantings to not only beautify but also to shield site operations and reduce noise.
- Consider facility hours of operation, the implementation of "quiet times" as well as procedures to reduce truck trip generation.
- When considering overhead lighting fixtures, attempt to reduce light "spillover" to adjacent sites.
- Consider use of "hostler" trucks to move trailer, chassis and containers internally on site, minimizing the need for full size trucking maneuvers, reducing both noise and emissions.
- At rail-served sites, consider the use of low emissions locomotives and Auxiliary Power Units (APUs) to reduce emissions and unnecessary idling while improving local air quality.

Railroad Improvement Funding Resources

Various programs exist on the federal level that provides funding to improve the nation's railroads for both freight and passengers. The Federal Railroad Administration (FRA) maintains various funding programs, such as competitive grants for track improvements or grade crossing improvements. Regional rail freight provider Genesee & Wyoming recently benefited from FRA grant money that targeted track improvements on the carrier's Gardner Branch, a route for ethanol into the greater region. Area railroads have also attempted to obtain federal funding for various improvements through the recent Transportation Investment Generating Economic Recovery (TIGER) grant program.

Industrial Rail Access Program

Most improvements to railroad infrastructure are privately funded. However, MassDOT's Industrial Rail Access Program, known as "IRAP", provides infrastructure improvement funding for modest-sized rail access projects. IRAP's primary focus is to provide businesses improved access to rail and freight infrastructure to enable them to connect with customers and opportunities throughout the greater region. A competitive program, IRAP provides financial assistance to eligible railroads, rail shippers and host communities that can identify a public benefit of increased rail transportation usage and/or economic development and job creation that would be realized through improved access to rail infrastructure.

Eligible projects include the construction of new loading tracks, storage tracks, and rail switches, as well as rail siding restoration. The benefits of such improvements include diverting substantial amounts of highway freight to the rails, supporting new jobs and reducing train movements through busy areas. Among the criteria for project approval is the level of public benefit offered, such as system preservation, mobility, economic development, and safety. Investments in rail and freight infrastructure also help reduce the number of trucks on area highways, in turn reducing congestion and Greenhouse Gas (GHG) emissions.

State funding for these types of projects must be matched with private funds. IRAP projects are implemented through IRAP Grant Agreements with industry rail shippers and/or freight railroads. No more than 60% of project costs are supported with state IRAP funds; at a minimum the remaining 40% of projects costs must be provided by the railroad operator and/or industry project sponsor. The maximum IRAP grant award cannot exceed $500K. Further, IRAP projects are expected to be completed within 2 years from initiation.

Previous IRAP recipients in the planning region have included:

- G&U Bulk Liquid Transloading Railyard Expansion Project, *Upton*
- Mid States Packaging Rail Siding Restoration, *Auburn*
- P&W Southbridge Street Bridge Replacement, *Worcester*
- P&W Southbridge Street Yard Wye Track, *Worcester*
- G&U Railyard Improvements, switching lead and sidings, *Hopedale*
- P&W Cargill Bridge Replacement, *Worcester*

Prioritization

Based on the preceding discussion, the following freight-related needs, for both highway and railroad, have been prioritized for further study or potential implementation.

Highway Trucking

A number of priority highway trucking-related projects have been identified in the planning region. Those listed below include studies and initiatives that need to be considered along with the Major Infrastructure (MI) projects for highways identified elsewhere in the LRTP. The financially-constrained, highway-related MI projects all appear to address various needs of the highway trucking industry, such as increasing roadway safety and reducing chronic congestion-US DOT emphasis areas. In addition to federal and state funding opportunities, other improvements could be supported through private sector funding, an example being the construction and operation of full-service rest stops catering to trucking. Still others may have

the opportunity to benefit from a public-private funding scenario, where private funding is used to leverage designated public monies.

Truck Parking Initiative

Consider implementation of full-service rest stops in the region serving the trucking industry, a potential public-private improvement effort. As noted, the trucking community often lacks adequate facilities to park, rest, bathe, eat, purchase fuel and make repairs.

The truck driver rest location system is a critical component of the nation's motor freight system. Its importance has been recognized in federal legislation, and its usefulness was evaluated on a nationwide basis in the federally mandated Jason's Law study. State and local jurisdictions are authorized to use federal funding allocations for its maintenance and improvement. Accordingly, a study conducted by the staff of the neighboring Boston MPO provided a summary of the following conclusions:

- The large commercial truck stop is the most important building block of the national rest location system.
- Western Massachusetts is well served by large rest locations, both in-state and neighboring states.
- The northwest arc of I-495 is a clear gap in the New England rest location system.
- Public rest areas on limited access highways contribute little to the truck driver rest location system because of factors such as small size, poor condition, or not being on a key long-distance corridor.
- Adding or expanding commercial truck stops is an effective method of reducing truck parking at unofficial locations, along with their associated safety challenges.
- Good design and new technologies can serve to mitigate both the real and perceived negative impacts of a commercial truck stop.
- Long-term economic growth will continue to place increased demands on the motor freight system and associated rest location system.
- Identifying viable locations for new truck stops could be an important planning focus area for strengthening the rest location system.
- Public on-highway rest areas supplement the commercial truck stop system. New instructional arrangements may be required to improve the condition and usefulness of these locations for all users.

Follow-up work on truck parking might potentially include observation and analysis of rest location utilization at key points in the highway network. Fieldwork could also include

interviews with drivers and truck stop operators. A list of potential future truck stop locations could also be assembled in collaboration with regional stakeholders.

Highway Freight Accommodation Assessment Study

Under the ongoing Corridor Profile study series, CMMPO staff suggests a potential future year study in the North & West transportation planning subregions: "Freight Accommodation Assessment for State Numbered Route". Such a study could look at the accommodation of both existing and anticipated future freight movement in these planning subregions. Such a study could potentially suggest a number of roadway improvement options to assure the continued flow of freight while mitigating any identified local impacts. Such a study would include Routes 9, 32, 62, 67, 122, 122A and 148. *(At one time a study of Route 67 in the host communities of North Brookfield, New Braintree and Barre was suggested but never pursued.)*

Continue Road Safety Audit (RSA) Study Series

The Road Safety Audits (RSA) effort lead by MassDOT should continue on a statewide basis. CMMPO transportation staff regularly participates in the RSAs in the planning region. Following visits to the field in order to observe local conditions first-hand, documented vehicle crash histories are reviewed and a summary document is produced. The results RSA report provides a listing of suggested improvement options for consideration by MassDOT and the host communities. Suggested improvements often benefit highway trucking activities on the region's major freight routes.

Recent RSAs conducted throughout the planning region include the following:

- **Oxford**, Southwest subregion, Route 20/Route 56
- **Shrewsbury**, Northeast subregion, Route 20/Grafton Street
- **Spencer**, West Subregion, Route 9 downtown area
- **Sutton**, Southeast subregion, Route 146
- **West Boylston**, North Subregion, Route 140
- **Worcester**, Central subregion, Kelly Square

As an example, a prior study of Route 20 through the entirety of Shrewsbury conducted by the CMMPO staff had identified suggested improvement options at the Route 20/Grafton Street intersection. Subsequently, a recent RSA was conducted at this same location. The RSA reaffirmed suggested improvement options that address congestion, pavement condition, safety as well as freight movement – a major UPS distribution facility is located adjacent to the intersection.

Based on a stakeholder request, it is suggested that MassDOT conduct a Road Safety Audit (RSA) at the large, channelized intersection of Route 9 with Route 49. Existing roadway geometry and observed high travel speeds has resulted in safety deficiencies at this heavily traveled location. In addition to improved signage and pavement markings, the potential future year installation of signalized control or a modern roundabout need to be considered at this location

Freight Railroads

The following lists priority freight rail projects identified in the planning region. Some will potentially be implemented using federal grant monies, others perhaps by the private sector with private funding. Still others may be able to benefit from a public-private funding scenario, such as the MassDOT's Industrial Rail Access Program (IRAP), where private railroad funding is often used to leverage additional public monies.

Improve Highway/Railroad At-Grade Crossings

Continue efforts to eliminate or mitigate hazards at public highway/railroad at-grade crossings. The MassDOT Grade Crossing Program seeks to improve safety at existing highway-rail grade crossings through the installation of protective devices. As necessary, improvements to public highway/railroad at-grade crossings should be considered an ongoing, as needed activity. Such improvements should occur at already-identified locations as well as those that may potentially be identified in the future.

Prevent Crashes with Overhead Railroad Structures

Further investigation should be conducted at those Overhead Railroad Crossing locations where reported crashes have occurred in recent years. Beyond bridge replacement or alterations, efforts should be made to ensure proper yellow diamond warning signs and other precautions or mitigation strategies that will serve to avoid, eliminate or reduce the number of truck crashes with low bridge structures in the planning region.

CSX

- Monitor potential sale of the CSX Boston Line or CSX Fitchburg Branch to another owner/operator.
- Potential for future year passenger rail service on the Boston Line between Worcester, Springfield, Pittsfield and potentially Albany, NY. Envisioned higher-speed and more frequent passenger service reviewed in the Northern New England Intercity Rail Initiative (NNEIRI) study and, currently, the now underway East-West Passenger Rail study.

East Brookfield & Spencer Railroad

- Various future improvements and expansion activities, including potential IRAP-funded track improvements or other activities.
- Other future improvement projects for the NEAG site will evolve due to vendor necessity or changing market conditions.
- Consider future year expansion of existing truck parking and rest facilities with amenities for both drivers and on-site personnel.

Grafton & Upton Railroad

- Implementation of various at-grade highway crossing improvements along southern segment of the line.
- Reestablished severed connection to CSX in Milford.
- Continue a range of ongoing freight yard maintenance, improvements, installation of on-site features that improve the efficiency of the movement of goods for G&U customers, both line-side and remotely located.
- Various future infrastructure improvements, including potential IRAP-funded activities.

MassCentral Railroad

- Ongoing track maintenance & various at-grade highway crossing improvements. *(The MC RR right-of-way is largely owned by the Commonwealth.)*

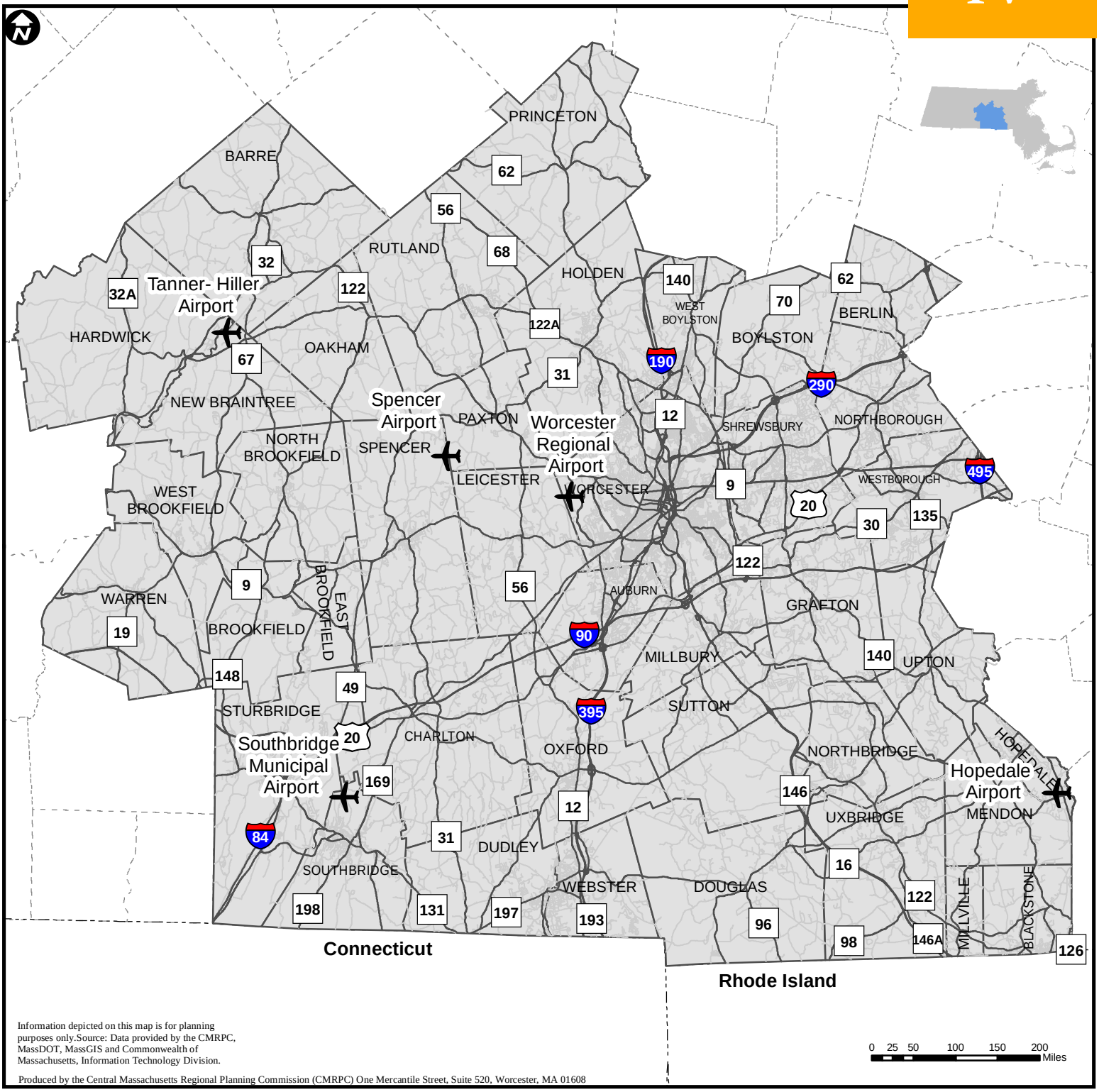
Airport

The region's airports are an essential component of the overall CMMPO region's transportation system. They serve personal, business, and recreational travel as well as freight movement. Although the number of passengers and the volume of freight moved by air may be relatively small compared to that of other modes serving the region, air transportation plays an important role.

As shown in Figure IV-34, the CMMPO region's five airports are:

1. the Hopedale Industrial Park Airport;
2. Southbridge Municipal Airport;
3. Spencer Airport;
4. Tanner-Hiller Airport (New Braintree), and
5. the Worcester Regional Airport.

With the exception of Worcester Regional Airport, these facilities are utility airports designed to accommodate smaller, lighter, general aviation aircraft. MassDOT's Aeronautics Division administers specific oversight and support duties for each as components of the Massachusetts Statewide Airport System Plan (MSASP). Worcester Regional Airport is classified as a "General Transport Airport"; it is owned and operated by the Massachusetts Port Authority (Massport).



Information depicted on this map is for planning purposes only.Source: Data provided by the CMRPC, MassDOT, MassGIS and Commonwealth of Massachusetts, Information Technology Division.

Produced by the Central Massachusetts Regional Planning Commission (CMRPC) One Mercantile Street, Suite 520, Worcester, MA 01608

CMMPO

CENTRAL MASSACHUSETTS Regional Planning Commission

Figure IV-34 Locational Map of the Region's Airports

Airport Locations

CMRPCTowns

Mobility2040 Invest in Your Transportation Future The Update for 2020

Worcester Regional Airport

Existing Condition and Future Needs

Worcester Regional Airport (ORH) was developed by the City of Worcester in 1946 on land in the municipalities of Worcester, Leicester, and Paxton. For several years prior to 2010, the Massachusetts Port Authority (Massport) operated the airport on the City's behalf; Massport subsequently assumed ownership and operation duties in 2010. As of April 2018, the facility employed approximately 150 employees.

At present, ORH aircraft and passenger throughput is increasing after a protracted period of service fluctuations trending toward decreased activity. At its peak in 1989, ORH served about 354,000 passengers, and in 2009, less than 50,000 passengers. In 2017, over 100,000 commercial passengers and 3,325 corporate jet passengers used the facility. In combination with other aircraft activity, ORH hosted an average of 77 daily aircraft operations.

The majority of ORH commercial passengers currently travel on JetBlue flights to Orlando, Fort Lauderdale, and, most recently, New York. In 2017, 109,911 commercial airline passengers flew out of ORH, resulting in a combined load factor for all commercial flights of 80%. Passengers also use Rectrix Commercial Aviation to fly to Hyannis and Nantucket, or for chartered flights.[7]

Activity factors, issues and advances include:

- size: few small airports generate enough traffic to fill larger planes multiple times a day. Accordingly, they fail to attract and retain the low-fare airlines that select and survive in markets with larger volumes. However, ORH retains ample airside and landside (terminal) capacity should market conditions change;
- facilities: activity breeds activity, including ground transportation and other services. Rectrix (operator of service to Cape Cod) invested $5 million in a 50,000-square-foot facility that opened in 2015, and as of April 2018 employed about 40 people;
- cargo potential: presently limited. Cargo flights in New England are currently concentrated at Logan, Green and airports at Windsor Locks, Hartford; Portsmouth, New Hampshire; and Bangor, Maine;
- corporate travel: corporate jet flights to the facility in 2017 were up more than 40 percent over 2015 levels;
- pricing: despite ORH's geographic location and presumed overhead cost advantage compared to larger airports, low-cost service has not thrived. In addition, carriers

[7] http://www.wrrb.org/wp-content/uploads/2018/09/WRRB-City-on-the-Move-September-2018.pdf

sometimes offer service from other airports to the same destinations at a lower cost. Recent activities may attract lower fares;

- airport access: a high percentage of ORH customers come from surrounding communities; thus, no single route option provides optimal access. Further, no single route directly connects the airport to the region's Interstate network. Finally, it was understood that wayfinding to/from the airport was a challenge. After efforts in the 1990's and early 2000's to develop a principal access route failed, Massport, MassDOT, the City of Worcester, and the CMMPO developed a near-term plan for improving directional signage to ORH. MassDOT and Massport consulted with local jurisdictions in which the signs would be placed, and MassDOT installed eighty signs on the six primary routes. Since that project was completed, GPS technology has also enhanced the public's ability to navigate to/from ORH in any direction;
- terrain and weather: ORH's site elevation above the surrounding terrain often puts it into fog and clouds, and at temperatures about five degrees colder in an area subject to severe winter weather. While flight delay rates are not substantially higher than other locations:

  a) historically, landings have had to divert to other area airports when conditions were below visibility requirements of 200 feet of ceiling height and less than 1,800-foot runway visibility, and

  b) departures have been affected by icing conditions not experienced at other nearby regional airports.

  To improve airside operations, Massport conducted vegetation clearing work in 2013. In March 2018, its long-awaited $32 million CAT III system investment became operational, enabling pilots to land planes with as low a visibility ceiling as 50' above the ground and a forward visual range as short as 600'. CAT III systems involve special lighting and aircraft signaling, and many major airlines and pilots are qualified to use them;
- market conditions: some industry professionals believe that air passenger market forces must drive provision of new service. Massport advises that it is spending approximately $400,000-$500,000 annually on marketing and advertising to promote the facility.

Each of the above factors are acknowledged; however, the weight of each factor in ORH's operating history (and outlook) remain unclear.

Less than ten years ago, the facility's future was uncertain. Abandoning airport operations was a consideration, but would have required the repayment of millions of dollars of aviation-associated grants. For that reason, and to preserve regional economic growth potential while capturing a share of projected aviation industry growth, Massport chose to position ORH as an

air facility emphasizing cargo/general aviation operations with capacity to increase passenger operations. Massport also committed to a ten-year, $100 million facility capital improvement program.

Future passenger activity will depend upon whether ORH offers greater convenience, less congestion, and optimal connections or direct destination services. As of this writing, carriers are adding services in increments. The New England Regional Airport System Plan (NERASP) suggested that Worcester Regional Airport could eventually handle 1.5 million passengers – if infrastructure and access were improved and airlines were in fact willing to offer service to popular destinations. The CMMPO cited a medium-growth planning scenario in Mobility2040 which projected upwards of 300,000 passenger departures at ORH by 2030.

The Worcester Regional Resource Bureau (WRRB) recommended:

- improved signage and signal prioritization of existing access routes at specific times;
- improved access between Union Station and ORH via WRTA, Uber, or Lyft;
- establishment of a direct over-the-road bus connection (like Logan Express) between Framingham and ORH, to promote MetroWest connectivity;
- revisit zoning and land use controls along access routes, to capture economic opportunities while reducing travel impediments (e.g., intersections, curb cuts, on-street parking), and
- that Massport consider developing new technologies—limited seating electric planes and automated drones for both transportation and distribution-at ORH.[8]

A viable airport operation at Worcester remains a top City of Worcester and CMMPO region transportation/economic development priority.

Other Airports in the Region

Characteristics and Inventory

Four utility-type airports serve the CMMPO region, as noted at the beginning of this Section. The Southbridge Municipal Airport in Southbridge, the Hopedale Industrial Park Airport in Hopedale, the Tanner-Hiller Airport in New Braintree, and Spencer Airport in Spencer are designed to accommodate smaller, lighter, general aviation aircraft. Table IV-23 lists some of the characteristics of these area airports.

[8] Worcester Regional Research Bureau, City On the Move: An Overview and Assessment of Worcester's Transportation Needs, September 2018, p. 12.

The majority of the operations at these smaller airports consist of general aviation flights. However, air taxi services are offered at the Hopedale Industrial Park Airport and Southbridge Municipal Airport. Also, a relatively small number of military flights occur at all of these locations.

Table IV-23: Airport Characteristics

	HOPEDALE INDUSTRIAL PARK AIRPORT	SOUTHBRIDGE MUNICIPAL AIRPORT	SPENCER AIRPORT	TANNER-HILLER AIRPORT	WORCESTER AIRPORT
Location	Hopedale	Southbridge	Spencer	New Braintree	Worcester-Leicester
Elevation	269 Ft	699 Ft	1040 Ft	589 Ft	1009 Ft
Runway	18/36	02/20	01/19	06/24	11/29, 15/33
Runway Dimensions	3172'x90'	3500'x75'	1950'x50'	3027'x40'	7000'x150', 5000'x100'
Runway Lighting	Low Intensity	Medium Intensity	Low Intensity	No	High/Medium Intensity
Airport Attended	Dawn-Dusk, Mon-Fri	8 AM-Dusk	9 AM-6 PM, Mon-Sat	8 AM-6 PM M-F 8 AM-4 PM Sat	Continuous
Registered Based Aircraft	14 Single Engine 1 Multi Engine	25 Single Engine 1 Multi Engine 1 Helicopter	25 Single Engine	4 Single Engine	59 Single Engine 6 Multi Engine
Operations Per Year	6,000	31,000	12,000	600	48,000
% Air Taxi	4%	3%	0	0	3%
% Local General Aviation	48%	48%	83%	86%	40%
% Transient General Aviation	48%	48%	17%	12%	55%
% Military	<1%	<1%	<1%	2%	<1%
% Commercial	0	0	0	0	1%

Of the four utility airports in the region, Southbridge Municipal Airport (3BO) is utilized the most and has been designated by MassDOT's Aeronautics Division (formerly the Massachusetts Aeronautics Commission) as part of the statewide airport system. All four of these airports are part of the statewide airport system. Southbridge Municipal Airport is owned and operated by the Town of Southbridge, is three miles northwest of its downtown and approximately five miles east of the Massachusetts Turnpike (I-90), Interstate 84, and US-20 via MA-131.

Located approximately two miles north of the City of Southbridge in Worcester County, Southbridge Municipal Airport serves the general aviation needs of the region. With its 3,501-foot runway, the airport can accommodate a wide range of general aviation aircraft. The facilities and services are ideal for accommodating the aviation needs of both local and transient users.

With the recently completed airport administration building and renovated airport restaurant, aviation enthusiasts and the general public are frequently visiting Southbridge Municipal Airport.

Infrastructure improvements have been studied and/or implemented to the airport's benefit. In the late 1990s, the three communities of Charlton, Southbridge and Sturbridge undertook a Corridor Planning Study. The communities' shared goal was to identify projects that might alleviate transportation problems in the area bounded roughly by MA-131, MA-169, and US-20. The Study team proposed A "Northern Connector" from US-20 in Charlton to a proposed access road connection to MA-169 in Southbridge. While neither Charlton nor Sturbridge supported this project, due to projected negative environmental, social and resident impacts, Southbridge believed it would produce the greatest traffic reductions on MA-131 while improving regional highway system access.

In 2011:

- the Airport Master Plan was updated, and officials pursued approval from FAA and other parties for a potential on-site solar energy installation;
- Commercial Drive (a link from MA-169 to the Airport/Industrial Park) was constructed. This project improved access to Casella Waste Systems on Barefoot Road, and provided a more direct and convenient link to the airport from points north. The Town hoped that this roadway would also generate additional industrial development, and
- Hangars and aircraft damage totaling $3 million occurred in a June 1 storm that produced tornado activity in several adjacent communities.

Officials conducting a post-storm assessment determined that storm conditions in the area in which the Airport was located did not meet thresholds for federal assistance. As a result, rebuilding would require insurance and Town-sourced funding. The FAA hoped to fast-track completion of the above-referenced Master Plan Update so that funding could be provided to the Town to restore normal airport operations as quickly as possible.

2014 was a turnaround year for Southbridge Municipal Airport. Consultants initiated plans to rebuild its facilities in March; the Town regained direct control of facility operations in May, and received $1 million from MassDOT's Aeronautics Division towards airport renovations. Also in 2014, Aeroventures, a flight school formerly based in Worcester, set up operations. While Aeroventures subsequently relocated to Mansfield that year, a similar flight school, Norby Aviation is active at the site today.

In 2017, the Town completed work on the airport's administration building. The first phase included the hangar/administration building design and Phase II of the project included the construction of the building. The funding split follows:

GRANT	PROJECT TYPE	DESCRIPTION	MassDOT	Airport	FAA	Total
9/16/2015	Construction	Southbridge Municipal Airport Reconstruction-Phase II	1,102,575	764,486 Includes Insurance Claim Payment	690,939	2,558,000
10/15/2015	Construction	Airport Hangar & Administration Building Design	38,889	13,050	209,061	261,000

Hopedale Industrial Park Airport: opened 1953, 3 miles SE of Hopedale town center. It is owned and operated by the Industrial Park, and is open to the public.

Located approximately three miles southeast of the Town of Hopedale in Worcester County, Hopedale Industrial Park Airport supports a variety of general aviation activities. With a single asphalt runway measuring 3,172 feet in length, the airport can accommodate a wide range of single and multi-engine general aviation aircraft, both local and itinerant.

The airport is located within Hopedale Industrial Park near Interstate 495. There are approximately 15 businesses in the industrial park, which attract customers to the airport for their transportation needs.

Spencer Airport: this airport, opened in 1946, is located two miles northeast of downtown. It is privately owned and operated, and is open to the public. As of 2016, ten aircraft were based on

the field, all of which were single-engine airplanes. For a twelve-month period ending April 27, 2016, the airport averaged 49 aircrafts per week. 78% of all operations were local general aviation, while 20% were transient general aviation, and 2% military.

Spencer Airport is a privately-owned, public-use airport located in central Massachusetts. Located approximately two miles northeast of the Town of Spencer in Worcester County, Spencer Airport serves the general aviation needs of the region. With a single asphalt runway measuring 1,949 feet in length, the airport can accommodate small single-engine general aviation aircraft. The facilities and services are ideal for accommodating the aviation needs of local users.

Tanner-Hiller Airport, Barre: opened in 1946 as a privately owned and managed airport located four miles southwest of Barre's town center. The airport's 3,027-foot paved runway can accommodate smaller general aviation aircraft. Its facilities and services are ideal for accommodating the aviation needs of both local and transient users. As of 2016, there were twenty-fine aircraft based on the on the field of which four were single-engine planes, fifteen were gliders, and six were ultralights. For a twelve-month period ending April 27, 2016, the airport averaged forty-seven aircraft operations per month, 88% of which were local general aviation, 9% were transient general aviation, and 3% military.

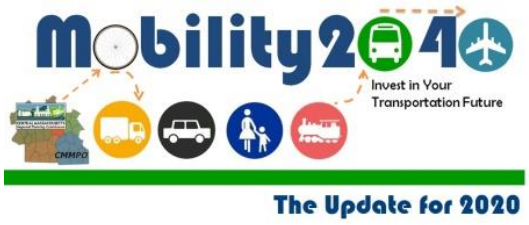
Tanner-Hiller Airport was recently purchased by G&C Group USA Inc., a company that invests in flight school management and general aviation airports. G&C proposes to renovate the airport, and will provide flight instruction on fixed-wing and rotary-wing aircraft at the airport after renovation. The new airport management team is focused on recreational opportunities at the airport and partnering with the region. Camping areas with river access for canoeing and kayaking are available adjacent to the airport.

Transit Signal Priority (TSP)

Increased paratransit vehicle/service efficiencies – pilot project(s), 2019

CHAPTER V

Summary of Needs



Introduction

This chapter summarizes the range of needs identified through the development process for the LRTP Update for 2020. The far-ranging multi-modal transportation needs of the region were inventoried in a variety of ways, including broad stakeholder and public input as well as informed through Management Systems data integration efforts that have been ongoing and evolving since the mid-1990's. Other needs that have been identified are associated with the transportation linkages subjects discussed earlier in the LRTP. Both modal and individual needs throughout the region are identified for a range of topic areas:

- Bicycle & pedestrian
- Public transit: Both fixed route & paratransit services and passenger rail, in such areas as on-time performance, safety & security and state of good repair.
- Highway: A number of focus areas concerning congestion, safety as well as pavement and bridge condition. Further, other highway needs were identified through the findings of the regional Travel Demand Modeling process, a software-based simulation of the region's multi-modal transportation network.
- Freight movement: Both highway and railroad freight activities are addressed as well as the airports serving the planning region.

The chapter concludes featuring a comprehensive listing of identified needs throughout the planning region. In the next chapter, it is demonstrated that by addressing these needs, the CMMPO can continue to meet the goals of the regional transportation planning process.

Summary of Needs

Data Informed Regional Priorities (Management System Data Integration)

Regional Priorities have been developed through a Management Systems approach, resulting in a number of roadway segments that demonstrate the greatest need for improvement. The segments used in the following analyses are based on staff's pavement data collection defined segments. These segments are usually less than one-mile in length and are between two selected minor streets. All data were analyzed based on these defined segments. The Management Systems approach combines congestion, safety, traffic volume, pavement condition, sidewalk condition, curb ramps, transit use, freight movement, environmental justice, and bridges related data in order to define "hot spots" throughout the CMRPC planning region. The ten management systems data was analyzed to create a score based on pre-determined criteria. Table V-1 shows the scoring methods for the roadway segments.

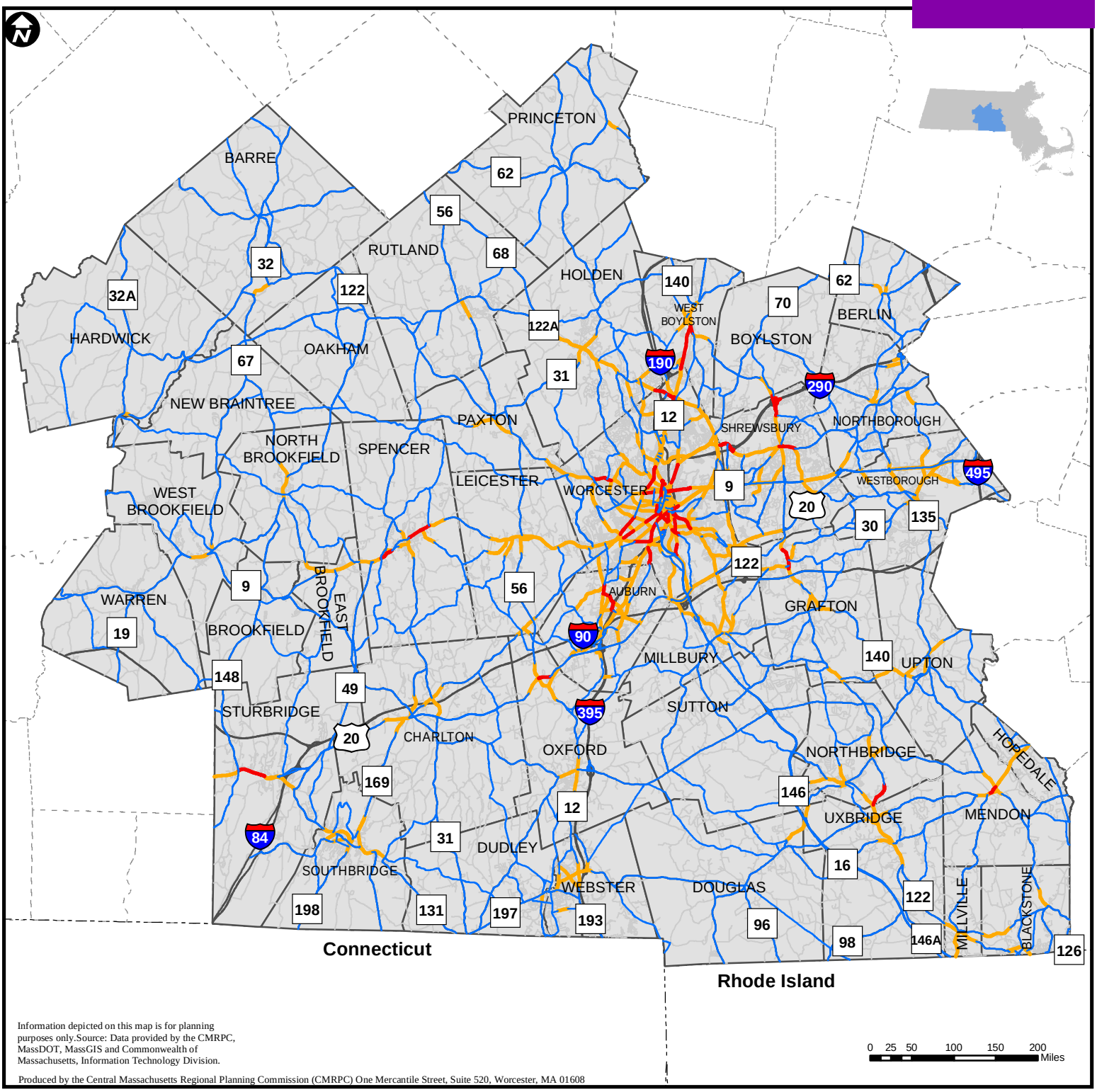
Table V-1: Management Systems Analysis Scoring Criteria

Management System	Type of Data Used	Scoring Criteria	Points
Congestion	CMRPC Transportation Model	Segment is Congested	5 points
		Segment is not Congested	0 points
Safety	MassDOT Crash Cluster Data (13-15)	Segment has a Fatality	5 points
		Segment has a Injury	3 points
		Segment only Property Damage	1 point
Traffic Volume	CMRPC Traffic Count Data	>30,000 VPD	5 points
		10,000 – 30,000 VPD	3 points
		<10,000 VPD	1 point
Pavement Condition	CMRPC Pavement Data	Segment is rated Very Poor	5 points
		Segment in rated Poor	3 points
		Segement is rate Fair	1 point
Transit	WRTA Data	Segment is on a Top 5 Route for Passenger Activity (11,19,26,27,30)	3 points
		Segment is on any other Bus Route	1 point
Freight	CMRPC Traffic Count Data	>1,000 Heavy Vehicles Per Day	5 points
		500 – 1,000 Heavy Vehicles	3 points

Management System	Type of Data Used	Scoring Criteria	Points
		Per Day	
Environmental Justice	CMRPC Data	Zero Vehicle or Households with 75+ Persons	3 points
		All other EJ Areas	1 piont
Sidewalks Condition	CMRPC Sidewalk Data	Segment is rated Poor	5 points
		Segment is rated Fair	3 points
Curb Ramps	CMRPC Curb Ramp Data	No Ramps Exist	5 points
		Ramps are Non-Compliant	3 points
		Ramps are Historic	1 point
Bridges	MassDOT Bridge Data	Segment has a Structurally Deficient Bridge	3 points
		Segment does not have a Structurally Deficient Bridge	0 points

Based on the above scoring criteria, Figure V-1 shows the roadway segment results in three catagories. Tier 1 segments are considered high priority, Tier 2 segments are considered medium priority, and Tier 3 segments are low priority. The Tier 1 roadway segments are listed by municipality in the Table V-2. A few Tier 1 segments were removed from the listing due to current ongoing or recently completed TIP projects on those segments.

For the future, staff will continue to update the data and also collect new data for segments that currently don't exist. Another work activity would be to identify gaps in the sidewalks network. The scoring is based on existing sidewalks and non-existant sidewalks are not considered. In addition, separating the roadway segments into rural and urban could be a way to show priorities for each type of area.



Information depicted on this map is for planning purposes only.Source: Data provided by the CMRPC, MassDOT, MassGIS and Commonwealth of Massachusetts, Information Technology Division.

Produced by the Central Massachusetts Regional Planning Commission (CMRPC) One Mercantile Street, Suite 520, Worcester, MA 01608

CMMPO

CENTRAL MASSACHUSETTS Regional Planning Commission

Figure V-1 Transportation Data Integration Overview

Legend

Dat Integration Tiers CMRPCTowns

- Tier 3
- Tier 2
- Tier 1

Mobility 2040 Invest in Your Transportation Future

The Update for 2020

Table V-2: Management Systems Tier 1 Roadway Segments

Community	Roadway	From	To
Auburn	Auburn Street	Vine Street	Oxford Street North
Auburn	Oxford Street North	Pinehurst Avenue	Auburn Street
Auburn	Vine Street	Auburn Street	Swanson Road
Grafton	North Main Street	Shrewsbury Street	Worcester Street
Mendon	Hastings Street	North Avenue	Washington Street
Northbridge	Providence Road	Union Street	Uxbridge Town Line
Oxford	Route 20	Turner Road	Route 56
Shrewsbury	Boylston Street	Boylston Town Line	Hill Street
Shrewsbury	Main Street	Maple Avenue	South Street
Shrewsbury	Main Street	Worcester City Line	I-290 EB Ramp
Spencer	Dewey Street	Main Street	West Main Street
Spencer	Main Street	Paxton Road	Grove Street
Sturbridge	Route 20	Route 148	Cedar Street
West Boylston	West Boylston Street	Worcester City Line	Woodland Street
West Boylston	West Boylston Street	Woodland Street	Wal-Mart Entrance
West Boylston	West Boylston Street	Wal-Mart Entrance	Central Street
West Boylston	Worcester Street	Church Street	Maple Street
Worcester	Belmont Street	Skyline Drive	Lincoln Street
Worcester	Cambridge Street	Southbridge Street	Canterbury Street
Worcester	College Street	Southbridge Street	Auburn Town Line
Worcester	Francis J McGrath	Southbridge Street	Green Street
Worcester	Grafton Street	Washington Square	Water Street
Worcester	Grafton Street	Water Street	Hamilton Street
Worcester	Grafton Street	Hamilton Street	Massasoit Road
Worcester	Green Street	Kelley Square	Foster Street
Worcester	Harding Street	Kelley Square	Ashmont Avenue
Worcester	Highland Street	West Street	Park Avenue
Worcester	Irving Street	Pleasant Street	Chandler Street
Worcester	Lancaster Street	Grove Street	John Street
Worcester	Lincoln Street	Burncoat Street	Catherine Street
Worcester	Madison Street	Main Street	Kelly Square
Worcester	Main Street	Hammond Street	Chandler Street
Worcester	Main Street	Maywood Street	Webster Street
Worcester	Mountain Street West	West Boylston Street	Holden Town Line
Worcester	Park Avenue	Grove Street	Institute Road
Worcester	Park Avenue	May Street	Mill Street
Worcester	Pleasant Street	May Street	Chandler Street
Worcester	Providence Street	Ames Street	Millbury Street
Worcester	Providence Street	Winthrop Street	Waverly Street
Worcester	Southbridge Street	Cambridge Street	Quinsigamond Ave

Community	Roadway	From	To
Worcester	West Boylston Street	Marland Road	East Mountain Street
Worcester	Winthrop Street	Granite Street	Vernon Street

Stakeholder/Public Input Regional Priorities

Regional Priorities were also developed in consultation with the CMMPO, MassDOT, regional stakeholders, as well as through public outreach efforts. CMMPO staff worked to develop a list of larger, long-term priorities and needs that would improve the transportation system for all modes based on the collected inputs.

Highway

- I-90 (Mass Pike)/I-495 Interchange – Westborough/Hopkinton
- I-495/MA-I-290 Interchange – Marlborough/Hudson
- I-290/Vernon Street/Kelley Square Bridge expansion – Worcester
- I-395/MA-16 Interchange – Webster
- US-20 Corridor – Charlton/Oxford
- US-20 Corridor – Worcester/Shrewsbury
- US-20/MA-131 intersection improvements (roundabout) – Sturbridge
- Central Turnpike resurfacing / reconstruction – Sutton
- MA-146 Frontage Roads – Millbury/Sutton
- MA-9/MA-67 intersection – West Brookfield/Ware
- MA-9/MA-49 intersection improvements (roundabout) – Spencer
- MA-31 corridor Improvements – Holden/Paxton/Spencer
- MA-31 /MA-197 intersection improvements – Dudley
- Kelley Square, Exit 13 – Worcester
- MA-62 Corridor Profile Study – Barre
- MA-140 corridor improvements – West Boylston
- MA-122 corridor improvements – Uxbridge
- Park Ave / Chandler Street intersection improvements – Worcester
- I-90 (Mass Pike)/MA-67 NEW interchange – Warren
- MA-146/I-290 West NEW ramp – Worcester
- MA-56 Worcester Airport access improvements – Leicester/Oxford

Bicycle / Pedestrian

- Sidewalk improvements

- Improve pedestrian signals and phasing
- Buffered/separated bicycle lanes
- Improve snow clearance on sidewalks along bridges, under bridges and rail crossing.
- Improve snow clearance at transit stops, crosswalks and curbs.
- New sidewalks along MA-131, major employers along this road and vicinity (Southbridge/Dudley) and a lot of people walk on the road because there are no sidewalks available.
- Start a bike share program (Worcester, Southbridge).
- Consider Safe-Routes-to-School Programin Southbridge

Trails

- Mass Central Rail Trail
- Mid State Trail – Spencer
- Boston-Worcester Air-Line Trail – Shrewsbury/Westborough
- Blackstone River Greenway (Segments 3,4,5) – Uxbridge, Northbridge, Grafton, Sutton and Millbury
- Expand Wachusett Trail to Barre downtown area

Transit

- New Fixed Route Service in WRTA Host Communities
- Transit Signal Priority (TSP) – WRTA Host Communities
- Transit "Mobility-Hubs" (transfer locations with added services and concessions) – WRTA Host Communities
- Bus Rapid Transit (BRT) or BRT "Light" on corridors with at least 3 bus routes – Worcester
- Service improvements – frequency, on-time performance, late night service
- Update and improve bus stop signs and it surroundings (lighting, crosswalks, shelters, wayfinding information, etc.)
- Local transit service to serve the Southbridge/Sturbridge local needs

Passenger Rail

- Boston-Worcester-Springfield High-Speed Rail (Passenger)
- Western MBTA Commuter Rail Extension: Worcester-Springfield
- MBTA Commuter Rail Extension: Worcester-Clinton
- Worcester-Providence Passenger Rail + Improvements
- Worcester – Nashua Passenger Rail

- MBTA Commuter Rail Station Upgrades – Worcester, Grafton, Westborough
- Transit connections from Northborugh to Westborough MBTA Commuter Rail Station
- Increase parking capacity at MBTA Commuter Rail Stations – Worcester, Grafton, Westborough
- Intermodal Traveler Information Systems (ITIS) with MBTA Commuter Rail information (next train arrival time, number of parking spaces available, etc.)

Freight Rail

- East Brookfield & Spencer Railroad Expansion & Improvements – East Brookfield/Spencer (Meadow Road reconstruction & MA-9/MA-49 intersection improvements)
- Grafton & Upton Railroad At-Grade Highway Crossing Improvements – Hopedale
- MassCentral Railroad Tracks Maintenance + Improvement – Hardwick/Barre
- North Brookfield Railroad Revitalization – East Brookfield/North Brookfield
- Genesee & Wyoming Inc.:
    - IRAP Track Improvements – Worcester
    - Southbridge Street Overpass – Worcester
    - Ma-30 (East Main Street) Overpass – Westborough
    - St. Paul Street Overpass – Blackstone

Freight

- Full Service Rest Stops in the Region for Trucking Industry along major highway corridors in the planning region (I-84, I-90, I-290, I-495).
- Improvements for trucking associated with existing UPS in Shrewsbury (US-20/Grafton Street Intersection + MA-140 nearby).

Vulnerable population related needs

Language assistance / information

- Translation of the WRTA Schedules to other languages. There was a request for Spanish. Some people mentioned that the schedules were too hard to understand.
- Request for automatic stop announcement system in Spanish.
- Implement a “WRTA Ambassador Program”. A suggestion from a former participant of the travel training service the WRTA provides. In essence, the program will train people from the community and they will support the WRTA travel trainer in “as needed” basis to communicate all the WRTA information in the refugees native language. That way people will feel welcomed and well taken care of.

- Asian population prefer the "one-on-one" interaction to ask about their transit needs, passes, etc., rather than using the "language assistance phone line" available at the WRTA Customer Service office.
- Develop a process to send updated transit information to service organizations and institutions that serve vulnerable populations. More than once we found that they share outdated information with their service population or were not aware of service changes.
- Develop a process to update transit information on the Bus Tracker and in Google Maps.
- "Need for a more culturally responsive transit service in the City."

Paratransit

- Provide transportation for the elderly outside the fixed-route/paratransit buffer area. Open the service for all elders in the town (Leicester).
- Many Latino Elderly individuals with approved PT-1s don't use the service (inconvenience of calling and making reservations 3 days in advance, they prefer to go to their medical appointments accompanied by a family member, or they can't communicate with the driver).
- Lack of transportation for elderly population to access services, shopping and recreational activities. Social service organizations don't have the financial capabilities to provide transportation service for their service population.
- Taxis are not on time and they are dirty and stinky.

Parking

- Consider "daylighting" and other parking strategies in communities with narrow streets approaching a main urban arterial. It is hard to see cars in the incoming traffic or pedestrians.
- Don't allow paring at both sides of the street on narrow streets.

Transit service / fares / passes

- Add Holiday service and late-night service for workers on the 3pm to 11pm shift.
- Add more trips on the weekend. Start earlier and end later on the weekends.
- Request for reduce fares for Veterans.
- Add more locations to reload the Charlie Card. Currently is only at the Hub. Consider approaching CVS, Walgreens and/or convenience stores to reload the card or buy one-day passes.
- Implement and promote an all-year youth transit pass.

- Install a change dispenser machine at the Hub. The farebox don't give change back if you put $2.00.
- Provide bike-sharing stations at the WRTA Hub facility and be able to use the transit pass to pay for the bike.

Safety

- Control speeds and improve pedestrian safety (crosswalks, rapid flashing beacons) along Lincoln Street corridor.
- Add lighting on school bus stops and its approaches. In winter time, the kids have to walk back and forth in the dark and wait for the bus in the dark.
- Add lighting under bridges (I-290 and P&W bridges).
- Add sidewalks and crosswalks around the Auburn Mall area.
- Don't allow bicyclists to ride on roads without a bike lane.

Parks, trails and recreation areas

- Improve community access to Green Hill Park and the Worcester East-West Trail.
- Improve access from elderly housing complexes to parks, walking trails and recreation areas.
- Include park information on bus schedules, or develop a separate information tool on how to access parks, walking trails and other recreational areas by transit.

Transportation Linkages

Sustainable Communities

Needs

The interaction between land use and transportation is critical to assess as their influence on one another helps shape sustainable development. The way in which land is developed or protected can have major implications on the ways in which residents and visitors navigate through the region. Land use patterns and zoning regulations determine where people choose to locate their homes and businesses in addition to the types of transportation infrastructures that are built and where they are built. Meanwhile the location and design of such transportation facilities including roadways, sidewalks, access points, and bicycle/pedestrian network can affect travel behaviors, accessibility needs, and regional connectivity. The land use patterns within the CMMPO region continue to change in response to development pressures

to support economic growth. However the disconnect that often occurs between housing production, commercial development, and regional transit investments poses a significant challenge for CMMPO communities. This is evidenced through sprawled land use patterns particularly housing that is located further from essential services or economic, town centers. This results in an automobile dependent culture that increases transportation demand and traffic congestion due to longer travel distances. In order to plan around future needs, a balanced planning approach between transportation and land use must be integrated. For example, village center overlay districts should be encouraged wherever possible as these areas are designed to preserve the historic context of the town center and to promote a safe framework for pedestrians, bicyclists and motorists. Village center overlay districts highlight mixed uses, while fostering economic growth through measures such as adaptive reuse of abandoned, vacant or underutilized buildings or structures within the district. Similarly, transit-oriented development focuses growth around transit stations that link people with residential, commercial, business, and entertainment activity. Therefor it is critical that the balanced approach is maintained to increase mobility while ensuring that residents and employees in the CMMPO region continue to experience a high quality of life. Accessibility to transportation enables development while density provides for increased walkability, resulting in attractive, vibrant neighborhoods and ultimately a sustainable region.

Prioritization

It is important that CMMPO communities integrate sustainable growth patterns of development into their local and regional planning efforts. Priority development areas provide immense opportunity for economic development and growth in the CMMPO region. Priority Development Areas (PDAs) are existing areas within a city or town that have been identified as capable of supporting additional development or as candidates for redevelopment. Priority Preservation Areas (PPAs) are areas within a city or town that deserve special protection due to the presence of significant environmental factors and natural features, and are not on lands that are currently permanently protected. In order to increase opportunities from potential developers, CMMPO communities should provide local officials with specific targets for preservation and conservation efforts, steering development into PDAs and other areas of potential development and redevelopment. Regionally significant development locations should be prioritized wherever possible. CMRPC staff have identified locations where development and preservation efforts should be targeted in the future to grow the region and maximize returns on public and private investment. Providing specific targets, however, requires maintaining the data to ensure the information is up to date in order to enhance and

facilitate development opportunities. It is important that CMMPO communities work with CMRPC staff to monitor and update their PDA and PPA information as a way to enhance their local economies and create dynamic places to live and work. More focus on these areas will help make them more marketable to potential developers, resulting in more compact, sustainable development patterns across the CMMPO region.

Individual Area/Mode Regional Priorities

Bicyle and Pedestrian

Needs / Next Steps

Bicycle

The CMMPO regional vision for bicycle transportation highlights the development of a connected bicycle network that is safe, convenient, and continuous for residents and visitors of all abilities. In order to achieve this, it is essential that all CMMPO member municipalities review and adopt the initiatives and recommendations as detailed in the *2019 CMMPO Regional Bicycle Plan.* The CMMPO communities should continue to utilize the MassDOT Complete Streets Funding Program process and resources to incorporate bicycle network planning into their policies, programs, and infrastructure planning. The most important planning elements to consider when determining bicycle needs are connections, design, aesthetics, and encouragement or education. In order to improve connectivity for cyclists in the CMMPO region, local and regional recreation spaces must be linked with residential areas, fixed route transit services, and commercial centers through policy and legislative changes as well as physical improvements to the transportation network. Additionally, connected facilities that are accessible for people of different ages and capabilities will lead to a greater range of appeal and usage. For instance, separated and multi-use pathways are helpful to users who do not have the experience level of daily cycling commuters, as well as those that use alternative mobility devices. Consideration should be given to the design of facilities that help enhance the overall bicycling experience such as pavement markings, signage, proper lighting, shade from the summer sun, availability of drinking water, and restroom facilities. This design component is especially important for longer facilities such as the Boston/Worcester Airline Trail and the Blackstone River Greenway. Finally, municipalities and CMMPO staff should coordinate outreach efforts and public education campaigns that will encourage local residents and visitors

to increase the level of bicycling and to educate all transportation users of their responsibilities on the road.

Pedestrian

The CMMPO regional vision for pedestrian transportation highlights the development of safe, accessible, well-connected, and comfortable walking accommodations to ensure mobility for all users. In order to achieve this, it is essential that all CMMPO member municipalities review and adopt the initiatives and recommendations as detailed in the *2019 CMMPO Regional Pedestrian Plan.* Pedestrian network planning must consider the different ways in which pedestrians interact with the built environment. Commuters needs aim to reduce reliance on the automobile for daily travel while recreational needs aim to better connect the gaps through sidewalks, multi-use paths, and signage and other accommodations. It is important that the harmony between commuter needs and recreational needs are balanced in order to achieve the ultimate goal of developing a well-connected regional pedestrian network. Pedestrian planning should be also reflected in the municipal planning process, particularly around land use development and the local economy. This includes explore holistic approaches to promote walkability through placemaking, public art, wayfinding, walking clubs, town center or downtown parking assessments, or neighborhood design guidelines. Additionally, consider non-traditional mechanisms to support local pedestrian planning efforts such as application for capital investments through state programs and grant opportunities such as the Community Compact Cabinet, Housing Choice Initiative, Community Development Block Grant (CDBG) Program, and MassWorks Infrastructure Program. For example, as part of the Community Compact Best Practices Program, the Transportation/Public Works Best Practice Area supports municipal action towards adopting Safe Routes to School programs, adapting streets to better accommodate all road users, and promoting safety and mobility for older drivers. Most importantly, future pedestrian planning should focus not only on the development of new infrastructures but also leveraging existing systems and assets that support pedestrian mobility and enrich our communities such as rail trails and shared-use of public rights-of-way.

Prioritization

Bicycle

For the purposes of Mobility2040, the crash clusters that are HSIP eligible are considered highest priority. Table V-3 shows the top 10 High Priority Bicycle Crash Locations in the CMMPO region. Candidate projects must be locations where the data indicates a high incidence of crash severity based on the Equivalent Property Damage Only (EPDO) index: Property Damage = 1

Point, Injury = 5 Points, and Fatality = 10 Points. For the purposes of the Long Range Transportation Plan, the top seven (7) crash cluster locations are eligible for HSIP funding through the Transportation Improvement Program (TIP). Although the remaining four intersections are not HSIP eligible, they are still a priority. The majority of these crash cluster locations are within the City of Worcester while only one is located in the town of Webster. Most crash cluster are concentrated along Main Street, Chandler Street, and Park Avenue. A Road Safety Audit must be completed for any HSIP funded TIP project. Please see the *2018 CMMPO Regional Safety Report* that includes years 2013-2015 for expanded discussion regarding other non-HISP eligible bicycle crash clusters.

Table V-3: CMMPO High Priority Bicycle Crash Clusters in the CMMPO Region

Crash Count	# Fatal	# Injury	# Non-Injury	EPDO	Location	Community
13	0	9	4	49	Main St/King St/May St	Worcester
16	0	8	8	48	Chandler St/Park Ave	Worcester
10	0	9	1	46	Belmont St	Worcester
12	0	6	6	36	Main St/Murray Ave	Worcester
7	0	6	1	31	Madison St/Francis J.	Worcester
9	0	5	4	29	Chandler St/Irving St	Worcester
7	0	5	2	27	Park Ave/Mill St	Worcester
9	0	4	5	25	Madison St/I-290	Worcester
6	0	4	2	22	Chandler St	Worcester
4	0	4	0	20	East Main St	Webster
4	0	4	0	20	Lincoln St/Country Club	Worcester

Pedestrian

The Massachusetts Department of Transportation generates a listing of Highway Safety Improvement Program (HSIP) eligible Auto, Bike, and Pedestrian clusters for the Commonwealth. A list of HSIP eligible locations for the CMRPC planning region was derived from the statewide list. Table V-4 shows the top 10 High Priority Pedestrian Crash Locations in the CMMPO region by EPDO. For the purposes of the Long Range Transportation Plan, the top seven (7) pedestrian crash clusters have been identified in the region as eligible for HSIP funding through the Transportation Improvement Program (TIP). Although the remaining four intersections are not HSIP eligible, they are still a priority. All but one location is within the City of Worcester. These locations are concentrated on Main Street, Chandler Street, and Park Avenue. A Road Safety Audit must be completed for any HSIP funded TIP project. Candidate projects must be locations where the data indicates a high incidence of crash severity based on the Equivalent Property Damage Only (EPDO) index: Property Damage = 1 Point; Injury = 5 Points; Fatality = 10 Points. Please see the *2018 CMMPO Regional Safety Report* that includes years 2013-2015 for expanded discussion regarding other non-HISP eligible bicycle crash clusters.

Table V-4: CMMPO High Priority Pedestrian Crash Clusters

Crash Count	# Fatal	# Injury	# Non-Injury	EPDO	Location	Community
90	0	63	27	342	Main St/Foster St	Worcester
28	1	21	6	121	Grafton St/Hamilton St	Worcester
31	1	20	10	120	Pleasant/Merrick/West	Worcester
25	2	18	5	115	Chandler St	Worcester
33	0	19	14	109	I-290/Harding St	Worcester
27	0	19	8	103	Belmont St/I-290	Worcester
25	1	17	7	102	Main/Freeland/Maywood	Worcester
26	0	19	7	102	Main St/Cambridge St	Worcester
20	0	19	1	96	Belmont St	Worcester
24	0	17	7	92	Main St/Murray Ave	Worcester
23	0	15	8	83	Main St/May St	Worcester

Public Transit and Passenger Rail

Fixed Route and Paratransit

Congestion / On-Time Performance

Needs

The CMMPO and the WRTA are working to develop or implement the following:

1. An agreement between MassDOT and WRTA on standardizing transit performance metrics.
2. Short-term improvements, including signal timing and traffic control signage.
3. Real-time technologies to improve communication between transit operators and supervisors.
4. Long-term transit congestion improvement options including roadway and intersection redesigns, existing dedicated transit lanes, or Intelligent Transportation Systems (ITS) capability, particularly Transit Signal Priority (TSP) at key intersections along congested routes. Such routes may include, but are not limited to, the following:

   Belmont Street — Pleasant Street
   Main Street — Shrewsbury Street
   Park Avenue — Southbridge Street

   All of the above roadways are located in the City of Worcester.
5. Continued refinement of both fixed route and paratransit services, including State of Good Repair (SGR) activities, and programming of new vehicles and other equipment to ensure reliability while minimizing service disruptions.

6. Implementing recommendations for addressing unmet paratransit service needs, as most recently identified in the 2019 CMRPC Coordinated Plan.

Safety and Security

Needs

The WRTA (with CMMPO assistance) will:

- update its SSPP, SMS, and COOP as needed;
- continue participating in CRHSAC regional emergency response planning, and
- continue working through CMRPC to advance Complete Streets techniques for roadway projects in the region, particularly in the vicinity of bus stop waiting areas.

State of Good Repair

Needs

The WRTA's long-term priority is to maintain SGR by continued facility maintenance and the programming of funds for facility projects as well as vehicle and equipment replacements. The CMMPO will continue to program WRTA capital projects utilizing federal funds; its most significant near-term investment is to replace its oldest fixed-route buses and paratransit vans, followed by select service vehicle replacements. The CMMPO expects to continue programming funds for WRTA capital needs during each TIP development each year.

The WRTA's suite of technology improvements were implemented in 2012-2013 and are expected to remain in use. The WRTA and CMRPC continuously monitor the development of new or upgraded technologies supporting SGR, and will procure or acquire these technologies as needed.

The WRTA is able to obtain adequate federal funding through apportionments and the FTA Section 5307 Program for capital needs, particularly for vehicle replacements. However, state – sourced capital funds often must be reallocated to preventative maintenance, to make up for limited state and local operating assistance. This practice has been reported in prior long-range plans and is expected to continue.

Transit SGR depends indirectly upon SGR activities associated with MassDOT and municipality-owned infrastructure assets. These improvements chiefly involve roadway maintenance, traffic controls and, pedestrian and bicyclist infrastructure connecting with transit.

Transit SGR must include prioritization of roadway maintenance and improvements on roadway segments identified elsewhere in this Plan (as listed in the previous Safety & Security section).

Intelligent Transportation System

Needs

The CMMPO will continue to assist the WRTA in working with MassDOT, other RTAs, and WRTA service providers to:

- Monitor existing ITS technology performance;
- Research and assist with new technology procurements;
- Identify and address ITS and related technology functionality issues, such as compatibility between RTA and MBTA Service Areas;
- Identify and plan for ITS implementation aiding development of Mobility as a Service (MaaS);
- Continue ITS implementation in the region's roadway network where transit operates, and
- Continue to support Worcester's efforts to upgrade intersection signals and enable Transit Signal Priority (TSP).

Access to Essential Services

Needs

The region's mobility needs have changed dramatically since the Comprehensive Service Assessment (CSA) was completed in 2015. The CSA consisted of a review of the WRTA's transit services as they existed in 2014-2015; exploration of local markets with potential ridership, and recommendations for developing new or modified services for those markets. After 2015, the WRTA was compelled to maintain service with lower than expected State operating funds, increased costs, and lower ridership. The advent of Transportation Network Companies (TNCs), an improved economy, and increased household access to automobiles – have contributed to low or no demand for some of the services recommended in the CSA. To date, the WRTA has maintained access to essential services while reducing or eliminating some unproductive services – and was able to implement some CSA service recommendations. The WRTA and CMMPO, mindful of key CSA recommendations, will continue to monitor demand and feasibility for:

System Core

- Increasing the number of routes operating on weekends;
- Improving schedules for routes which operate on weekends along mainline corridors, and
- Implementing new "cross-town" services beyond current bus pairings and outside existing routes' "hub-and-spoke" alignments.

System Periphery

- Implementing transit in a new corridor at the southernmost part of the region connecting the towns of Dudley, Southbridge, Sturbridge and Webster. Local residents and officials continue to advocate for such a service at WRTA public meetings and other transportation and community development events.

Region-Wide

- New or modified paratransit services that maintain a high level of service above and beyond requirements while addressing unmet needs as most recently identified in the 2019 CMRPC Coordinated Plan.

Next Steps/Prioritization

The travel demand model will be used to analyze recommendations from the CSA. New bus routes, existing route expansions and route changes are coded into the model to understand the new ridership and the travel behavior of the commuters. Funding availability will play a major role in the timeframe for implementation.

Intercity Bus

Needs

CMRPC staff has and will continue to participate in MassDOT initiatives to coordinate intercity bus services that operate or deliver service in the CMMPO region. In addition, the CMMPO expects to continue to program FTA funds supporting the ongoing operation of the Union Station Intermodal Transportation Center, which is served by both Greyhound and Peter Pan Bus Lines. No plans to develop new facilities for intercity bus transportation in the region are known to be active.

Commuter and Intercity Rail

Needs

While the CMMPO does not program funding for MBTA Commuter Rail or Amtrak operations, it programs FTA funds awarded to the WRTA for ongoing support of Worcester's Union Station. CMMPO's Transportation staff identifies future passenger rail needs through active involvement in passenger rail policy development, ongoing service monitoring, and coordination of WRTA services with MBTA Commuter Rail schedules to ensure that passengers can make connections between Commuter Rail and local transit.

Most near-term passenger rail future needs (1-5 years) will involve improvement or expansion of services now operated by Amtrak and the MBTA, and include:

- Positive Train Control system installation, testing and implementation;
- Worcester Union Station passenger platform upgrades and ancillary SGR repairs (detailed in Chapter 4);
- Implementation of MBTA AFC 2.0 (2019-2021), including Commuter Rail for the first time
- Parking capacity expansion projects at stations east of Worcester on the Framingham-Worcester Line;
- MBTA Commuter Rail ITS implementation, i.e. Automated Passenger Counting (APC) on coaches

Longer term passenger rail needs will be identified in two studies now underway:

1) The MassDOT East-West Rail Feasibility Study: initiated in December 2018, this Study will build upon the NNEIRI Study (2016) and develop additional information for capital investments required to operate enhanced passenger service from Worcester to points in Western MA. The CMMPO will summarize the Study's findings in its next Long-Range Transportation Plan, and

2) MassDOT's Rail Vision Study: this Study's purpose is to set clear objectives for a future MBTA rail system. Study tasks in progress include:

- evaluating service concepts for all Commuter Rail lines to project potential ridership benefits and required infrastructure changes;
- developing seven service alternatives using a range of service approaches and technologies, and
- hosting five Advisory Committee meetings to gather feedback on proposed objectives, service concepts, initial results, and seven service alternatives.

This Study is expected to be completed during 2019; its findings will be summarized in the next LRTP.

Also noted in Chapter 4 is the possibility of passenger rail between Providence, RI and Worcester, with an extension to Lowell, MA and Nashua, NH. The private proponent of this service has suggested that facility and equipment investments might qualify for federal funding, No details are available at this time on transit investments that would be required in the CMRPC region to support this potential service.

Auto Travel

Congestion

Needs

The CMMPO planning staff has compiled an extensive listing of CMP intersections that endure recurring congestion. The listing includes 215 intersections collected between 2010 and 2018. Of the total number of intersection locations, 58 encounter above average vehicle delay. In order to meet CMMPO established performance management goals, efforts should be made to address identified deficiencies at top congested locations. Often, by addressing critical intersection location, operations on adjacent roadway segments can be improved.

In addition to intersections, the CMMPO staff also analyzes roadway segments. Numerous Travel Time and Delay studies have been conducted on the regions roadways since 2010. These studies show where delay occurs and the amount of congested time along a roadway segment. The segments with a high amount of congested time should be improved in order to reduce delays and increase travel time reliability.

Prioritization

For the purposes of plan, the top 10 congested intersections and roadway segments analyzed through ongoing CMP efforts are considered highest priority. Table V-5 and Table V-6 lists these top locations. The total peak hour delay is the total number of minutes that drivers as a group wait at the intersection during the AM + PM peak hours. As mentioned above, additional critical intersections and roadway segments could also be considered for future year improvements, especially if other performance-based planning targets are concurrently addressed. By focusing improvement funding on these carefully selected locations, the region's performance-based goals stated earlier in the document can be effectively addressed.

Table V-5: Top 10 Congested Intersections included in Regional CMP

Community	Intersection	Total Peak Hour Delay
Millbury	Route 122/Mass Pike	11647
Worcester	Foster St/Francis J McGrath/Franklin St/Green St	10908
Worcester	Cambridge St/Southbridge St	10501
Shrewsbury	Route 140/Main St	9099
Westborough	Route 9/Lyman St	8907
Shrewsbury	Main St/N Quinsigamond Ave/Holden St	8563
Mendon	Route 140/Hartford Ave	7720
Millbury	Main St/McCracken Rd/Rt 146 SB Ramps/Shoppes	7660
Webster	I-395 NB Ramps/Route 16/Sutton Rd	7538
Worcester	Plantation St/Lincoln St	7306

Table V-6: Top 10 Congested Roadway Segments

Community	Roadway Segment
Webster	Routes 12/16
Holden	Route 122A
Worcester	Grafton St
Worcester	Highland St
Worcester	Park Ave
Westborough	Route 30
Worcester	Main St
Worcester	Pleasant St
Worcester	Interstate 290
Westborough	Route 135/Upton Rd

Safety

Needs

The Massachusetts Department of Transportation generates a listing of HSIP eligible Auto, Bike, and Pedestrian clusters for the Commonwealth. A list of HSIP eligible projects for the CMRPC planning region was derived from the statewide list. Data for the period of 2013-2015 includes a total of one hundred and eighty one (181) automobile, seven (7) bicycle, and eleven (11)

pedestrian clusters identified as HSIP eligible in the region. (It should be noted that mainline Interstate crash clusters have been removed from consideration due to jurisdictional issues.)

Prioritization

For the purposes of the Long Range Transportation Plan, crashes from the CMRPC region's share of the statewide Top 200 are considered highest priority. These twenty eight (28) locations are provided in Table V-7 on the following page. Additional HSIP eligible crash locations have been identified for the region, and placed in lower tier levels. Please see Chapter 4 for expanded discussion regarding Tiers II & III, as well as other non-HISP eligible crash clusters.

With limited funding available, HSIP specific target funds are used to develop projects that provide the greatest improvement in safety. Improving the CMRPC region's share of the statewide Top 200 Automobile clusters will help to work toward achieving the safety related goals and performance measures laid out in Chapter II of Mobility2040. Since Mobility2040 is a multimodal Long Range Transportation Plan, bicycle and pedestrian HSIP eligible locations have been prioritized in their respective sections. Clusters have been ranked by EPDO, or, Equivalent Property Damage Only (EPDO) index: ▫ Property Damage = 1 Point ▫ Injury = 5 Points ▫ Fatality = 10 Points. Further guidance is expected as to how to prioritize HSIP locations that will advance the "Zero Deaths" goal.

Table V-7 Region's Intersections included in the Top 200 High Crash Locations

Rank	City / Town	Intersection	EPDO
1	Worcester	Kelley Square / Water Street	542
19	Worcester	Belmont Street / Edward Street	186
20	Webster	Worcester Road / East Main Street	185
33	Worcester	Chandler Street / Murray Avenue	160
39	Worcester	Park Avenue / May Street	152
55	Westborough	Boston-Worcester Turnpike / Otis Street	140
59	Worcester	Main Street / Park Avenue	138
62	Worcester	Harvard Street / Lincoln Square	135
67	Worcester	Park Avenue / Maywood Street	132
77	Worcester	Main Street / Chandler Street	129
80	Worcester	Southbridge Street / Hammond Street	128
83	Worcester	Chandler Street / Mason Street	126
91	Shrewsbury	Hartford Turnpike / Grafton Street	124
95	Westborough	Boston-Worcester Turnpike / Lyman Street	122
103	Worcester	Southbridge Street / Madison Street	119
110	Auburn	Washington Street / Millbury Street	118
114	Worcester	Main Street / Mill Street	117
116	Worcester	East Central Street / Summer Street	116
120	Worcester	Grafton Street / Mendon Street	114
120	Worcester	Highland Street (Lincoln Square) / Main Street	114
120	Worcester	Lincoln Street / Beverly Road	114
140	Worcester	Main Street / May Street	110
150	Worcester	Highland Street / Park Avenue	107
155	Worcester	Chandler Street / Piedmont Street	106
158	Worcester	Main Street / Curtis Parkway	105
161	Worcester	Canterbury Street / Gardner Street	104
171	Sutton	Worcester-Providence Turnpike / Boston Road	102
185	Shrewsbury	Boston Turnpike / South Street	100

Pavement and State of Good Repair

Needs

In the Central Massachusetts planning region, the largest burden for road asset maintenance rests with the towns. Funding to maintain these assets comes primarily through Chapter 90 funding and sometimes through special apportionment from the towns themselves. Some Federal aid eligible town maintained roadways are funded through the TIP every year. CMMPO staff has identified an approximate $15 million annual funding shortfall to maintain the current federal-aid system, as these same resources are stretched to address congestion, safety, and other transportation issues. The towns have the added burden of local roads that are ineligible for federal aid funding. Even with Chapter 90 apportionment, the Massachusetts Highway Association (MHA) identified an approximate $30 million annual funding shortfall for towns to maintain the pavement of their roadways.

Prioritization

Pavement, Sidewalks and Curb Ramps

For the purpose of the Mobility2040 update, a list of roadway segments has been prioritized to improve the region's state of good repair. Table V-8 lists those segments identified as top regional priorities. To qualify for this list a segment must have pavement in Poor or Very Poor condition, sidewalks in Poor or Fair condition and curb ramps classified as Non-Compliant or No Ramps.

Table V-8: Top Regional Roadway Segment Priorities

City/Town	Route	From	To
Auburn	Cedar Street	South Street	Oxford Street South
Auburn	Southbridge Street	Worcester City Line	Easton Avenue
Auburn	Southbridge Street	Easton Avenue	Auburn Street
Auburn	South Street	Central Street	Washington Street
Grafton	Main Street	Pleasant Street	Sutton Town Line
Hardwick	Church Street	Harwick Road	Lower Road
Hardwick	Main Street	Church Street	New Braintree Road
Leicester	North Main Street	Warren Avenue	Main Street
Millville	Lincoln Street	Main Street	Thayer Street
Millville	Main Street	Central Street	Blackstone Town Line
Millville	Central Street	Quaker Street	Rhode Island State Line
North Brookfield	East Brookfield Road	Ward Street	Donovan Road

City/Town	Route	From	To
North Brookfield	North Main Street	South Main Street	Oakham Road
North Brookfield	New Braintree Road	Oakham Road	Bell Road
Northbridge	Hill Street	Fowler Road	Goldwathe Road
Princeton	Main Street	Leominster Road	Redemption Rock Trail North
Southbridge	West Street	South Street	Main Street
Warren	Southbridge Road	Maple Street	Washington Street
Webster	Park Avenue	East Main Street	Thompson Road
Webster	Klebart Avenue	Brandes Street	School Street
West Brookfield	Church Street	North Main Street	Cemetary Gate
Worcester	Andover Street	Gosnold Street	West Boylston Street
Worcester	Mill Street	Airport Drive	June Street
Worcester	Maywood Street	Main Street	Park Avenue
Worcester	Franklin Street	Foster Street	Grafton Street
Worcester	College Street	Southbridge Street	Auburn Town Line
Worcester	Francis J. McGrath Blvd	Southbridge Street	Green Street
Worcester	Southbridge Street	I-290 WB Ramp	Auburn Town Line

Bridges

For the purpose of the Mobility2040 update, a list of bridges has been prioritized to improve the region's state of good repair. The following tables include bridges identified as top regional priorities. To qualify, a bridge must be Structurally Deficent. Table V-9 includes those bridge on the NHS and Table V-10 includes those off the NHS. The CMMPO should first prioritize those bridges located on the NHS for repair then those that are not on the NHS.

Table V-9: Structurally Deficient Bridges on the NHS

City/Town	Road	Under Bridge	Owner
Auburn	Washington St(Rt 20 EB)	I-395	MassDOT
Auburn	Washington St(Rt 20 WB)	I-395	MassDOT
Auburn	I-90 EB	Southbridge St(Rt 12)	MassDOT
Auburn	I-90 WB	Southbridge St(Rt 12)	MassDOT
Charlton	Sturbridge Rd(Rt 20)	Cady Brook	MassDOT
Dudley	Route 131	Quinebaug River	MassDOT
Millbury	Route 146	West Main St	MassDOT
Millbury	I-90 Ramps	I-90	MassDOT
Millbury	Route 20 WB	Route 146 & PWRR	MassDOT
Northborough	I-290 WB	MDC Aqueduct & CSX	MassDOT
Shrewsbury	Boylston St(Rt 140)	I-290	MassDOT
Southbridge	Main St(Rt 131)	Quinebaug River	MassDOT
Westborough	I-495 NB	RR MBTA/CSX	MassDOT

City/Town	Road	Under Bridge	Owner
Westborough	I-495 SB	RR MBTA/CSX	MassDOT
Westborough	I-90 EB	RR MBTA/CSX	MassDOT
Worcester	Grafton St(Rt 122)	Southwest Cutoff (Rt 20)	MassDOT
Worcester	I-290 EB	East Central St	MassDOT
Worcester	I-290 WB	East Central St	MassDOT
Worceste	I-190 NB	Route 12 NB & Ramp B	MassDOT

Table V-10: Structurally Deficient Bridges not on the NHS

City/Town	Road	Under Bridge	Owner
Auburn	Oxford St	Kettle Brook	Town
Auburn	I-90 Ramps	I-90	MassDOT
Auburn	I-90 Ramps	Southbridge St(Rt 12)	MassDOT
Barre	New Braintree Rd(Rt 32)	Ware Canal	MassDOT
Barre	Main St(Rt 32)	Canal Overflow	MassDOT
Barre	Hubbardston Rd(Rt 62)	Canesto Brook	Town
Blackstone	Elm St	Mill River	Town
East Brookfield	South Pond Rd	South Pond Inlet	Town
Hardwick	Creamery Rd	Ware River	Town
Hardwick	Access Gate 3	Quabbin Reservoir	Other State Agencies
Holden	Reservoir St(Rt 31)	P&W RR	MassDOT
Holden	Salisbury St	P&W RR	MassDOT
Holden	Mt. Pleasant Ave	Asnebumskit Brook	Town
Millbury	South Main St	Blackstone River	Town
Northborough	Whitney St	CSX RR	MassDOT
Northbridge	Providence St(Rt 122)	P&W RR	MassDOT
Northbridge	Linwood Ave	Linwood River	Town
Oxford	Leicester Rd(Rt 56)	French River	Town
Southbridge	Mill St	McKinstry Brook	Town
Spencer	North Spencer Rd(Rt 31)	Seven Mile River	Town
Sutton	Depot St	Blackstone River	Town
Sutton	Blackstone St	Blackstone River	Town
Uxbridge	Homeward Ave	P&W RR	MassDOT
Uxbridge	Rt 146 SB Ramp A	Emerson Brook	MassDOT
West Boylston	Hartwell St	Blackstone/Millville RR	MassDOT
West Brookfield	Wickabog Valley	Sucker Brook	Town
West Brookfield	Foster Hill Rd	Coys Brook	Town
Worcester	June St	Tatnuck Brook	Town
Worcester	West Boylston St(Rt 12 NB)	P&W RR	MassDOT
Worcester	Harrison St	I-290	MassDOT
Worcester	Laurel St	I-290	MassDOT

City/Town	Road	Under Bridge	Owner
Worcester	Route 12 NB	Neponset St	MassDOT

Travel Demand Model

Needs

Given the limited funding to expand the transportation system, there is a need to look at innovative ways to reduce congestion by looking more deeply at transportation demand management techniques. Transit, walking and bicycling are modes that can improve livability and public health. Some of the initiatives that could help alleviate congestion are investing in increasing and promoting transit use and investing in programs that reduce single occupancy vehicle use such as Park and Ride lots and expansion of sidewalks and bike lanes. Intelligent Transportation Systems can also be used for both recurring and non-recurring congestion like construction and accident delays.

Prioritization / Next Steps

Staff will continue maintaining its regional travel model by updating network and land use data, and will:

- develop model capabilities to measure key Performance Measure metrics developed as part to this Plan;
- generate model outputs to assist with TIP project scoring;
- analyze potential benefits of ramp metering on I-290 ramps. Use the Transmodeler micro-simulation to aid in the effort.
- Model potential and implemented WRTA service changes as requested, including changes recommended in the 2015 Comprehensive Service Analysis
- Improve the model's capability to more accurately reflect freight (truck) travel.
- Develop enhanced mode-specific performance measures that aid benefit and burden analysis for proposed projects, and
- Aid in the traffic management plan development during the construction of major regional projects.

Freight Movement: Highway Trucking & Railroads

Needs / Prioritization

Summarized from the detailed discussion provided in Chapter 4, the following freight-related needs for both highway and railroad have been prioritized for further study or potential future year implementation.

Highway Trucking

A number of priority highway trucking-related projects have been identified in the planning region. They include both studies and initiatives that should be considered *beyond* the Major Infrastructure (MI) projects for highways identified elsewhere in the LRTP. The financially-constrained, highway-related MI projects all appear to address various needs of the highway trucking industry, such as increasing roadway safety and reducing chronic congestion-US DOT emphasis areas.

Beyond typical federal and state funding resources, such suggested improvements could be supported through private sector funding, an example being the construction and operation of full-service rest stops catering to trucking. Still others may have the opportunity to benefit from a public-private funding scenario, where private funding is used to leverage designated public monies.

Truck Parking Initiative

Consider implementation of modern, full-service rest stops in the region serving the trucking industry, a potential public-private improvement effort. As is known, the trucking community often lacks adequate facilities to park, rest, bathe, eat, purchase fuel and make repairs.

Follow-up work on truck parking might potentially include observation and analysis of rest location utilization at key points in the highway network. Fieldwork could also include interviews with drivers and truck stop operators. A list of potential future truck stop locations could also be assembled in collaboration with regional stakeholders.

Highway Freight Accommodation Assessment Study

Under the ongoing Corridor Profile study series, CMMPO staff suggests a potential future year study in the North & West transportation planning subregions: “Freight Accommodation Assessment for State Numbered Route”. Such a study would assess the accommodation of both existing and anticipated future freight movement in these planning subregions. Such a study could potentially suggest a number of roadway improvement options to assure the

continued flow of freight while mitigating any identified local impacts. Such a study would include Routes 9, 32, 62, 67, 122, 122A and 148.

Continue Road Safety Audit (RSA) Study Series

The Road Safety Audit (RSA) effort lead by MassDOT should continue on a statewide basis. CMMPO staff regularly participate in the RSAs in the planning region. Following visits to the field in order to observe local conditions first-hand, documented vehicle crash histories are reviewed and a summary document is produced. The resulting RSA report provides a listing of suggested improvement options for consideration by MassDOT and the host communities. Suggested improvements often benefit highway trucking activities on the region's major freight routes.

Based on a stakeholder request, it is suggested that MassDOT conduct a Road Safety Audit (RSA) at the large, channelized intersection of Route 9 with Route 49. Existing roadway geometry and observed high travel speeds have resulted in safety deficiencies at this heavily traveled location. In addition to improved signage and pavement markings, the potential future year installation of signalized control or a modern roundabout need to be considered at this location.

Freight Railroads

The following lists priority freight rail-related studies and projects identified in the planning region. Some will potentially be implemented using federal grant monies; others perhaps by the private sector with private funding. Still others may be able to benefit from a public-private funding scenario, such as the MassDOT's Industrial Rail Access Program (IRAP), where private railroad funding is often used to leverage available public monies.

Improve Highway/Railroad At-Grade Crossings

Continue efforts to eliminate or mitigate hazards at public highway/railroad at-grade crossings. The MassDOT Grade Crossing Program seeks to improve safety at existing highway-rail grade crossings through the installation of protective devices. As necessary, improvements to public at-grade crossings should be considered an ongoing, as needed activity. Such improvements should occur at already-identified locations as well as those that may potentially be identified in the future.

Prevent Crashes with Overhead Railroad Structures

Further investigation should be conducted at those Overhead Railroad Crossing locations where reported crashes have occurred in recent years. Beyond bridge replacement or alterations,

efforts should be made to ensure proper yellow diamond warning signs and other precautions or mitigation strategies that will serve to avoid, eliminate or reduce the number of truck crashes with low bridge structures in the planning region.

Additional rail freight provider-specific Needs are summarized below:

CSX

- Monitor now underway East-West Passenger Rail study; support future year implementation efforts. Potential for future year passenger rail service on the CSX Boston Line between Worcester, Springfield, Pittsfield and potentially Albany, NY. Envisioned higher-speed and more frequent passenger service initially reviewed in the Northern New England Intercity Rail Initiative (NNEIRI) study.

East Brookfield & Spencer Railroad

- Various future improvements and expansion activities, including potential IRAP-funded track improvements or other activities. Other future improvement projects for the NEAG site will evolve due to vendor necessity or changing market conditions.
- Consider future year expansion of existing truck parking and rest facilities with amenities for both drivers and on-site personnel.

Grafton & Upton Railroad

- Implementation of various at-grade highway crossing improvements along southern segment of the line.
- Reestablish severed connection to CSX in Milford.
- Continue a range of ongoing freight yard maintenance, improvements, installation of on-site features that improve the efficiency of the movement of goods.
- Various future infrastructure improvements, including potential IRAP-funded activities.

MassCentral Railroad

- Ongoing track maintenance & various at-grade highway crossing improvements. *(The MC RR right-of-way is largely owned by the Commonwealth.)*

North Brookfield Railroad

- Revitalization effort ongoing to restore freight service to dormant five-mile railroad while providing opportunities for new line-side industry. Restoration of major at-grade highway rail crossing on Route 9 in East Brookfield anticipated should revitalization plans move forward.

Genesee & Wyoming Incorporated

- Implementation of awarded IRAP-funded track improvements in Worcester's Southbridge Street Yard, including replacement of substandard railroad bridge over Southbridge Street to accommodate heavier railcars.
- Needs associated with potential hosting of Worcester-Providence, RI passenger rail service operated by outside entity Boston Surface Railroad.

Pan Am Railways

- Various future infrastructure improvements, including potential IRAP-funded activities.
- Needs associated with potential hosting of Worcester-Lowell-Nashua, NH passenger rail service operated by outside entity Boston Surface Railroad.

ICI Wiser Avenue Intermodal Facility

- Various future infrastructure improvements, including potential IRAP-funded activities.
- Continue to investigate potential further expansion of the Wiser Avenue intermodal facility. Consider a range of on-site improvements to improve safety and efficiency of container handling.
- Consider future year expansion of existing truck parking and rest facilities with amenities for both drivers and on-site personnel.

Airport

Needs

For the smaller airports in the region, State of Good Repair (SGR) activities predominate. Among these airports, the most significant recent needs have been addressed at Southbridge Municipal Airport which hosts a recently completed airport administration building and renovated airport restaurant. Pavement management is perhaps the most significant need in the near future: MassDOT Aeronautics in 2017 prepared its statewide Airport Pavement Management System, which contains complete evaluations of existing pavement conditions and recommended pavement management investments for 2018-2023 as follows:

- Hopedale Industrial Park Airport: $3.4 million
- Southbridge Municipal Airport: $2.4 million
- Spencer Airport: $1.1 million
- Tanner-Hiller Airport: $1.7 million

MassDOT's Aeronautics Division will continue to assist most of the region's airports with State of Good Repair and capital improvement programs.

Between 2010 and 2018 Massport invested $100 million in Worcester Regional Airport. Many longstanding facility needs that were addressed during that period included a $5 million manufacturing hanger, a new $3.2 million new fire station and security personnel area; $2.5 million in terminal roof repairs and HVAC upgrades; and $2 million in security improvements. Most recently, a $30 million CAT III Instrument Landing System became operational.

Massport's FYs 19-23 Capital Improvement Program includes $43 million in improvements for Worcester Regional Airport. Of this proposed total investment, $9 million is programmed for improvements to Runways 11-29, including the proposed replacement of an existing Engineered Materials Arresting System (EMAS). The EMAS is a component of a Runway Safety Area to prevent injury and damage from aircraft incursions. In addition, $2,200,00 is budgeted for construction of two new jet bridges that will be installed to accommodate more passengers. A complete overview of Massport's proposed FYs 19-23 capital improvements for Worcester Regional Airport is viewable at http://www.massport.com/media/3120/board-book-fy19-23-capital-program.pdf.

In addition to those improvements programmed in Massport's FYs 19-23 budget, it is anticipated that the February 2019 acquisition of Rectrix Commercial Aviation Services Inc. by Ross Aviation will catalyze development of a new 20,000-square-foot hangar and fuel farm under a lease amendment with Massport.

Conclusion

Summary of Needs

Through the development of the Mobility2040: The Update for 2020, the region's long range transportation plan, the CMMPO was able to identify a set of needs by work areas. A list of those needs is provided in Table V-11.

Some of the needs are programmatic in nature, changes in processes, policies or protocols. There are other set of needs that will require more research, the completion of corridor profile studies, among others. Many of the needs identified can be addressed through the Transportaion Improvement Program (TIP), to improve the safety and/or operations in a corridor, or by addressing congestion, whereas other needs will require partnerships between governmental organizations, institutions, stakeholders, communities and the general public to be able to move from concept to reality. It is also important to note that some of the needs are can only be addressed with State's intervention in partnership with the CMMPO.

The critical aspect to address these needs is the support of the host communities. Given the financial constraints that the CMMPO is subjected to, it is imperative to work hand-in-hand with all the CMMPO communities and multiple partners to achieve the goals set for 2040. During the next four-years, the CMMPO will embark on the implementation of the region's priorities based on the set of needs presented below.

TABLE V-11

CMMPO Summary of Needs

MAJOR INFRASTRUTURE PROJECTS		
	Community	**Description**
1	Westborough/Hopkinton	I-90 (Mass Pike)/I-495 Interchange
2	Worcester	Kelley Square reconstruction and safety improvements
3	West Brookfield	MA-9 Widening and corridor improvements
4	Charlton/Oxford	US-20 Corridor
5	Millbury/Sutton	MA-146 Frontage Roads between W Main Street and Boston Road
6	Sutton	Central Turnpike resurfacing / reconstruction
7	Northborough	US-20 / MA-9 Bridge replacement and ramp improvements
8	Worcester	Kelley Square, Exit 13
9	Worcester	I-290/Vernon Street/Kelley Square Bridge expansion
10	Worcester	US-20 Corridor improvements
11	Shrewsbury	US-20 Master Plan Corridor improvements
12	Auburn / Oxford / Charlton / Sturbridge	I-90 (MassPike) from I-84 to I-290 improvements
13	Warren	I-90 (Mass Pike)/MA-19 NEW interchange
14	Worcester	MA-146/I-290 West NEW ramp
15	Leicester/Oxford	MA-56 Worcester Airport access improvements
SAFETY		
	Community	**Description**
1	Worcester	Belmont Street / Edward Street
2	Webster	Worcester Road / East Main Street
3	Worcester	Chandler Street / Murray Avenue

4	Worcester	Park Avenue / May Street
5	Westborough	Boston-Worcester Turnpike / Otis Street
6	Worcester	Main Street / Park Avenue
7	Worcester	Harvard Street / Lincoln Square
8	Worcester	Park Avenue / Maywood Street
9	Worcester	Main Street / Chandler Street
10	Worcester	Southbridge Street / Hammond Street
11	Worcester	Chandler Street / Mason Street
12	Shrewsbury	Hartford Turnpike / Grafton Street
13	Westborough	Boston-Worcester Turnpike / Lyman Street
14	Worcester	Southbridge Street / Madison Street
15	Auburn	Washington Street / Millbury Street
16	Worcester	Main Street / Mill Street
17	Worcester	East Central Street / Summer Street
18	Worcester	Grafton Street / Mendon Street
19	Worcester	Highland Street (Lincoln Square) / Main Street
20	Worcester	Lincoln Street / Beverly Road
21	Worcester	Main Street / May Street
22	Worcester	Highland Street / Park Avenue
23	Worcester	Chandler Street / Piedmont Street
24	Worcester	Main Street / Curtis Parkway
25	Worcester	Canterbury Street / Gardner Street
26	Sutton	Worcester-Providence Turnpike / Boston Road
27	Shrewsbury	Boston Turnpike / South Street
PAVEMENT		
	Community	**Description**
1	Auburn	Cedar Street from South Street to Oxford Street South
2	Auburn	Southbridge Street from Worcester City Line to Easton Avenue

3	Auburn	Southbridge Street from Easton Avenue to Auburn Street
4	Auburn	South Street from Central Street to Washington Street
5	Grafton	Main Street from Pleasant Street to Sutton Town Line
6	Hardwick	Church Street from Harwick Road to Lower Road
7	Hardwick	Main Street from Church Street to New Braintree Road
8	Leicester	North Main Street from Warren Avenue to Main Street
9	Millville	Lincoln Street from Main Street to Thayer Street
10	Millville	Main Street from Central Street to Blackstone Town Line
11	Millville	Central Street from Quaker Street to Rhode Island State Line
12	North Brookfield	East Brookfield Road from Ward Street to Donovan Road
13	North Brookfield	North Main Street from South Main Street to Oakham Road
14	North Brookfield	New Braintree Road from Oakham Road to Bell Road
15	Northbridge	Hill Street from Fowler Road to Goldwathe Road
16	Princeton	Main Street from Leominster Road to Redemption Rock Trail North
17	Southbridge	West Street from South Street to Main Street
18	Warren	Southbridge Road from Maple Street to Washington Street
19	Webster	Park Avenue from East Main Street to Thompson Road
20	Webster	Klebart Avenue from Brandes Street to School Street
21	West Brookfield	Church Street from North Main Street to Cemetary Gate
22	Worcester	Andover Street from Gosnold Street to West Boylston Street
23	Worcester	Mill Street from Airport Drive to June Street
24	Worcester	Maywood Street from Main Street to Park Avenue
25	Worcester	Franklin Street from Foster Street to Grafton Street
26	Worcester	College Street from Southbridge Street to Auburn Town Line
27	Worcester	Francis J. McGrath Blvd from Southbridge Street to Green Street
28	Worcester	Southbridge Street from I-290 WB Ramp to Auburn Town Line
BRIDGES		
	Community	**Description**

1	Auburn	Washington St(Rt 20 EB) over I-395
2	Auburn	Washington St(Rt 20 WB) over I-395
3	Auburn	I-90 EB over Southbridge St(Rt 12)
4	Auburn	I-90 WB over Southbridge St(Rt 12)
5	Charlton	Sturbridge Rd(Rt 20) over Cady Brook
6	Dudley	Route 131 over Quinebaug River
7	Millbury	Route 146 over West Main St
8	Millbury	I-90 Ramps over I-90
9	Millbury	Route 20 WB over Route 146 & PWRR
10	Northborough	I-290 WB over MDC Aqueduct & CSX
11	Shrewsbury	Boylston St(Rt 140) over I-290
12	Southbridge	Main St(Rt 131) over Quinebaug River
13	Westborough	I-495 NB over RR MBTA/CSX
14	Westborough	I-495 SB over RR MBTA/CSX
15	Westborough	I-90 EB over RR MBTA/CSX
16	Worcester	Grafton St(Rt 122) over Southwest Cutoff (Rt 20)
17	Worcester	I-290 EB over East Central St
18	Worcester	I-290 WB over East Central St
19	Worcester	I-190 NB over Route 12 NB & Ramp B
20	Auburn	Oxford St over Kettle Brook
21	Auburn	I-90 Ramps over I-90
22	Auburn	I-90 Ramps over Southbridge St(Rt 12)
23	Barre	New Braintree Rd(Rt 32) over Ware Canal
24	Barre	Main St(Rt 32) over Canal Overflow
25	Barre	Hubbardston Rd(Rt 62) over Canesto Brook
26	Blackstone	Elm St over Mill River
27	East Brookfield	South Pond Rd over South Pond Inlet
28	Hardwick	Creamery Rd over Ware River

29	Hardwick	Access Gate 3 over Quabbin Reservoir
30	Holden	Reservoir St(Rt 31) over P&W RR
31	Holden	Salisbury St over P&W RR
32	Holden	Mt. Pleasant Ave over Asnebumskit Brook
33	Millbury	South Main St over Blackstone River
34	Northborough	Whitney St over CSX RR
35	Northbridge	Providence St(Rt 122) over P&W RR
36	Northbridge	Linwood Ave over Linwood River
37	Oxford	Leicester Rd(Rt 56) over French River
38	Southbridge	Mill St over McKinstry Brook
39	Spencer	North Spencer Rd(Rt 31) over Seven Mile River
40	Sutton	Depot St over Blackstone River
41	Sutton	Blackstone St over Blackstone River
42	Uxbridge	Homeward Ave over P&W RR
43	Uxbridge	Rt 146 SB Ramp A over Emerson Brook
44	West Boylston	Hartwell St over Blackstone/Millville RR
45	West Brookfield	Wickabog Valley over Sucker Brook
46	West Brookfield	Foster Hill Rd over Coys Brook
47	Worcester	June St over Tatnuck Brook
48	Worcester	West Boylston St(Rt 12 NB) over P&W RR
49	Worcester	Harrison St over I-290
50	Worcester	Laurel St over I-290
51	Worcester	Route 12 NB over Neponset St
FREIGHT		
	Community	**Description**
1	Region-wide, State-wide	Truck Parking Initiative: find locations for modern, full-service rest stops
2	North & West Subregions	Freight Accommodation Assessment for State Numbered Routes
3	Spencer	Conduct RSA at intersection of Route 9 with Route 49

4	Region-wide, State-wide	Improve Highway/Railroad At-Grade Crossings
5	Region-wide, State-wide	Prevent Crashes with Overhead Railroad Structures
6	Region-wide, State-wide	East-West Passenger Rail Study, CSX, Worcester, Springfield & Pittsfield
7	East Brookfield & Spencer	EB&S RR improvements & expansion NEAG site
8	Grafton, Upton, Hopedale	G&U RR at-grade crossing improvements & connection to CSX in Milford
9	Barre, Hardwick, New Braintree	MC RR track maintenance & at-grade crossing improvements
10	East Brookfield & North Brookfield	North Brookfield Railroad Revitalization
11	Worcester, Blackstone Valley	G&W Inc hosting Worcester-Providence, RI passenger rail by BSR
12	West Boylston, Worcester	PanAm hosting Worcester-Lowell-Nashua, NH passenger rail by BSR
13	Worcester	Intransit Container improvements & expansion at Wiser Avenue Transload
14	Hopedale	Grafton & Upton Railroad At-Grade Highway Crossing Improvements
15	Hardwick/Barre	MassCentral Railroad Tracks Maintenance + Improvement
16	East Brookfield/North Brookfield	North Brookfield Railroad Revitalization
17	Worcester	Genesee & Wyoming Inc. IRAP Track Improvements
18	Worcester	Genesee & Wyoming Inc. Southbridge Street Overpass
19	Westborough	Genesee & Wyoming Inc. MA-30 (East Main Street) Overpass
20	Blackstone	Genesee & Wyoming Inc. St. Paul Street Overpass
21	Region	Full Service Rest Stops in the Region for Trucking Industry along major highway corridors in the planning region (I-84, I-90, I-290, I-495).
22	Shrewsbury	Improvements for trucking associated with existing UPS in Shrewsbury (US-20/Grafton Street Intersection + MA-140 nearby).
23	East Brookfield/Spencer	East Brookfield & Spencer Railroad Expansion & Improvements (Meadow Road reconstruction & MA-9/MA-49 intersection improvements)

AIRPORTS		
	Community	**Description**
1	Barre/New Braintree	Repairs and Reconstruction
2	Hopedale	Repairs and Reconstruction
3	Southbridge	Repairs and Reconstruction

4	Spencer	Repairs and Reconstruction
PUBLIC OUTREACH - HIGHWAY PROJECTS		
	Community	**Description**
1	Sturbridge	US-20/MA-131 intersection improvements (roundabout)
2	Webster	I-395/MA-16 Interchange
3	West Brookfield/Ware	MA-9/MA-67 intersection
4	Spencer	MA-9/MA-49 intersection improvements (roundabout)
5	Holden/Paxton/Spencer	MA-31 corridor Improvements
6	Dudley	MA-31 /MA-197 intersection improvements
7	Barre	MA-62 Corridor Profile Study
8	West Boylston	MA-140 corridor improvements
9	Uxbridge	MA-122 corridor improvements
10	Worcester	Park Ave / Chandler Street intersection improvements
PEDESTRIAN		
	Community	**Description**
1	Worcester	Main St/Foster St
2	Worcester	Grafton St/Hamilton St
3	Worcester	Pleasant/Merrick/West
4	Worcester	Chandler St
5	Worcester	I-290/Harding St
6	Worcester	Belmont St/I-290
7	Worcester	Main/Freeland/Maywood
8	Worcester	Main St/Cambridge St
9	Worcester	Belmont St
10	Worcester	Main St/Murray Ave
11	Worcester	Main St/May St
12	Region	Sidewalk improvements

13	Region	Improve pedestrian signals and phasing
14	Region	Improve snow clearance on sidewalks along bridges, under bridges and rail crossing.
15	Region	Improve snow clearance at transit stops, crosswalks and curbs.
16	Southbridge/Dudley	New sidewalks along MA-131, major employers along this road and vicinity (Southbridge/Dudley) and a lot of people walk on the road because there are no sidewalks available.
17	Southbridge	Consider Safe-Routes-to-School Program in Southbridge
18	Region	Add lighting on school bus stops and its approaches. In winter time, the kids have to walk back and forth in the dark and wait for the bus in the dark.
19	Worcester	Add lighting under bridges (I-290 and P&W bridges).
20	Auburn	Add sidewalks and crosswalks around the Auburn Mall area.
21	Worcester	Control speeds and improve pedestrian safety (crosswalks, rapid flashing beacons) along Lincoln Street corridor.
BICYCLE		
	Community	**Description**
1	Worcester	Main St/King St/May St
2	Worcester	Chandler St/Park Ave
3	Worcester	Belmont St
4	Worcester	Main St/Murray Ave
5	Worcester	Madison St/Francis J.
6	Worcester	Chandler St/Irving St
7	Worcester	Park Ave/Mill St
8	Worcester	Madison St/I-290
9	Worcester	Chandler St
10	Webster	East Main St
11	Worcester	Lincoln St/Country Club
12	Region	Buffered/separated bicycle lanes
13	Worcester and Southbridge	Start a bike share program (Worcester, Southbridge).

14	Region	Enforcement: Don't allow bicyclists to ride on roads without a bike lane.
TRAILS		
	Community	**Description**
1	Franklin, Bellingham, Blackstone, Millville, Uxbridge and Douglas	Current initiative in Douglas, 146A to Connecticut line, design underway and construction within 2-5 years
2	West Boylston, Holden, Rutland, Oakham and Barre	Central 30-mile section of the Mass Central Rail Trail
3	Douglas, Sutton, Oxford, Charlton, Spencer, Leicester, Oakham, Rutland, Barre, Princeton,	A scenic 92-mile hiking trail/footpath extending from Rhode Island through central Massachusetts and connects to the Wapack Trail in New Hampshire
4	Brimfield, Sturbridge, and Southbridge	A multimodal, accessible, rail trail that extends 6 miles traveling in an east-west direction. Part of the larger 66 mile Titanic Rail Trail system.
5	Blackstone, Millville, Uxbridge, Northbridge, Grafton, Sutton, Millbury and Worcester	Envisioned as a 50-mile greenway and paved multi-use pathway that will connect Providence, RI to Worcester, MA along the Blackstone River corridor.
6	Uxbridge to Route 122a in Millbury	13 miles of planned trail network designed and permitted but suspended due to complexity of the segments. Unclear feasbility as an off-road path. DCR encourages leadership and coordination between towns and MassDOT to complete
7	Spencer	Mid State Trail
8	Shrewsbury/Westborough	Boston-Worcester Air-Line Trail
9	Uxbridge, Northbridge, Grafton, Sutton and Millbury	Blackstone River Greenway (Segments 3,4,5)
10	Barre	Expand Wachusett Trail to Barre downtown area
11	New Braintree	Mass Central Rail Trail
12	Worcester	Improve community access to Green Hill Park and the Worcester East-West Trail.
13	Region	Improve access from elderly housing complexes to parks, walking trails and recreation areas.

14	Region	Include park information on bus schedules, or develop a separate information tool on how to access parks, walking trails and other recreational areas by transit.
PARKING		
	Community	**Description**
1	Region	Consider "daylighting" and other parking strategies in communities with narrow streets approaching a main urban arterial. It is hard to see cars in the incoming traffic or pedestrians.
2	Region	Don't allow paring at both sides of the street on narrow streets.
TRANSIT		
	Community	**Description**
1	Worcester	WRTA Hub
2	Worcester	WRTA Maintenance & Operations Facility
3	Worcester	Union Station - Operation, Maintenance and Upgrades
4	Worcester	Revenue Vehicle Replacements
5	Service Area	Service Vehicle Replacements
6	Service Area	Information Technology (IT) Upgrades
7	Service Area	ITS - Transit Signal Priority (TSP) Implementation
8	Service Area	Farebox Technology Replacement
9	Service Area	Service Enhancements/Efficiencies, Fixed Routes
10	Service Area	Paratransit Services Improvements
11	Worcester	Maintain Union Station IC Bus Facility
12	Sturbridge	Feasibility of adding or expanding IC Bus Service US-20
13	Worcester	Reconstruct Union Station Passenger Platform to add Center Platform
14	Westborough	Add parking at MBTA Westborough Station
15	MBTA Service Area	Positive Train Control (PTC) Implementation
16	MBTA Service Area	Automated Fare Collection (AFC) 2.0 Implementation
17	MBTA Service Area	Trainset Equipment Rehabilitation and Replacement

18	WRTA Host Communities	Transit Signal Priority (TSP)
19	WRTA Host Communities	Transit "Mobility-Hubs" (transfer locations with added services and concessions)
20	Worcester	Bus Rapid Transit (BRT) or BRT "Light" on corridors with at least 3 bus routes
21	WRTA Host Communities	Service improvements – frequency, on-time performance, late night service
22	WRTA Host Communities	Update and improve bus stop signs and it surroundings (lighting, crosswalks, shelters, wayfinding information, etc.)
23	Southbridge/Sturbridge	Local transit service to serve the Southbridge/Sturbridge local needs
24	Boston, Worcester, Springfield	Boston-Worcester-Springfield High-Speed Rail (Passenger)
25	Worcester, Springfield	Western MBTA Commuter Rail Extension: Worcester-Springfield
26	Worcester, Clinton	MBTA Commuter Rail Extension: Worcester-Clinton
27	Worcester, Providence	Worcester-Providence Passenger Rail + Improvements
28	Worcester, Nashua	Worcester – Nashua Passenger Rail
29	Worcester, Grafton, Westborough	MBTA Commuter Rail Station Upgrades
30	Northborugh/Westborough	Transit connections from Northborugh to Westborough MBTA Commuter Rail Station
31	Worcester, Grafton, Westborough	Increase parking capacity at MBTA Commuter Rail Stations –
32	Region	Intermodal Traveler Information Systems (ITIS) with MBTA Commuter Rail information (next train arrival time, number of parking spaces available, etc.)
33	Region	Translation of the WRTA Schedules to other languages. There was a request for Spanish. Some people mentioned that the schedules were too hard to understand.
34	Region	Request for automatic stop announcement system in Spanish.
35	Region	Implement a "WRTA Ambassador Program" to supprt the WRTA Travel Trainer.
36	Region	Provide customer service personnel Asian population prefer the "one-on-one" interaction to ask about their transit needs, passes, etc., rather than using the "language assistance phone line" available at the WRTA Customer Service office.
37	Region	Develop a process to send updated transit information to organizations and institutions that serve vulnerable populations.
38	Region	Develop a process to update transit information on the Bus Tracker and in Google Maps.
39	Region	"Need for a more culturally responsive transit service in the City."

40	Leicester	Provide transportation for the elderly outside the fixed-route/paratransit buffer area. Open the service for all elders in the town (Leicester).
41	Region	Same day on-demand with Spanish speaking drivers.
42	Region	Transportation for elderly population to access services, shopping and recreational activities. Social service organizations don't have the financial capabilities to provide transportation service for their service population.
43	Region	Promote cleanliness and reliability of taxi service
44	Region	Add Holiday service and late-night service for workers on the 3pm to 11pm shift.
45	Region	Add more trips on the weekend. Start earlier and end later on the weekends.
46	Region	Request for reduce fares for Veterans.
47	Region	Add more locations to reload the Charlie Card. Currently is only at the Hub. Consider approaching CVS, Walgreens and/or convenience stores to reload the card or buy one-day passes.
48	Region	Implement and promote an all-year youth transit pass.
49	Worcester	Install a change dispenser machine at the Hub. The farebox don't give change back if you put $2.00.
50	Worcester	Provide bike-sharing stations at the WRTA Hub facility and be able to use the transit pass to pay for the bike.
CONGESTION		
	Community	**Description**
1	Millbury	Route 122/Mass Pike
2	Worcester	Foster St/Francis J McGrath/Franklin St/Green St
3	Worcester	Cambridge St/Southbridge St
4	Shrewsbury	Route 140/Main St
5	Westborough	Route 9/Lyman St
6	Shrewsbury	Main St/N Quinsigamond Ave/Holden St
7	Mendon	Route 140/Hartford Ave
8	Millbury	Main St/McCracken Rd/Rt 146 SB Ramps/Shoppes

9	Webster	I-395 NB Ramps/Route 16/Sutton Rd
10	Worcester	Plantation St/Lincoln St
11	Webster	Routes 12/16
12	Holden	Route 122A
13	Worcester	Grafton St
14	Worcester	Highland St
15	Worcester	Park Ave
16	Westborough	Route 30
17	Worcester	Main St
18	Worcester	Pleasant St
19	Worcester	Interstate 290
20	Westborough	Route 135/Upton Rd
FLOOD ZONE A		
	Community	**Description**
1	Auburn	Southbridge Street (MA-12) from Worcester City Line to Oxford Town Line
2	Charlton	US-20 from Sturbridge Road to Southbridge Road
3	Douglas	Main Street (MA-16) from NE Main Street to SW Main Street
4	Douglas	Webster Street (MA-16) from Webster Town Line to SW Main Street
5	Douglas	South Street from Rhode Island State Line to SW Main Street
6	Dudley	West Main Street (MA-197) from Connecticut State Line to Webster Town Line
7	Leicester	Huntoon Memorial Highway (MA-56) to Pleasant Street
8	Leicester	Main Street (MA-9) from Worcester City Line to Spencer Town Line
9	Leicester	Paxton Street (MA-56) from Paxton Town Line to Main Street
10	Northborough	Main Street (US-20) from South Street to Marlborough City Line
11	Northborough	South Street (MA-135) from W Main Street to Westborough Town Line
12	Oxford	Main Street (MA-12) from Southbridge Road to Webster Town Line
13	Oxford	Southbridge Road (US-20) from Chrlton Town Line to Auburn Town Line
14	Paxton	Pleasant Street (MA-122) from Rutland Town Line to Worcester City Line

15	Paxton	West Street (MA-31) from Pleasant Street to Spencer Town Line
16	Shrewsbury	Boston Turnpike (MA-9) from Northborough Town Line to Worcester City Line
17	Shrewsbury	Clinton Street (MA-70) from Worcester City Line to Boylston Town Line
18	Shrewsbury	Hartford Turnpike (US-20) from Worcester City Line to Northborough Town Line
19	Spencer	N Spencer Road (MA-31) from Pleasant Street to Paxton Town Line
20	Sturbridge	Brookfield Road (MA-148) from Brookfield Town Line to Main Street
21	Sturbridge	Charlton Road (US-20)
22	Sturbridge	Main Street (MA-131)
24	Sutton	Worcester Providence Turnpike (MA-146)
25	Uxbridge	Providence Pike (MA-146)
26	Uxbridge	Quaker Highway (MA-146A) and South Main Street
27	West Boylston	Beaman Street (MA-140) from Worester Street to Thomas Street
28	West Boylston	North Main Street (MA-140) from Thomas Street to Sterling Town Line
29	West Boylston	Temple Street (MA-140) from Boylston Town Line to Maple Street
30	West Boylston	Worcester Street (MA-12) from Lancaster Street to Worcester City Line
31	Westborough	East Main Street (MA-30) from Rotary to Southborough Town Line
32	Westborough	Milk Street (MA-135) and West Main Street
33	Westborough	South Street (MA-135) from Rotary to Hopkinton Road
34	Worcester	Belmont Street (MA-9) and Lake Avenue North
CULVERTS		
	Community	**Description**
1	Warren	Single culvert at Keyes Road
2	Auburn	Single culvert at Booth Road
3	Millbury	Single culvert at Carleton Road

CHAPTER VI

Programs and Projects Prioritization

Introduction

Throughout the development of this document, the CMMPO has embarked on a process to define programs and assess projects for future programming. The prioritization combines multi-modal priorities from three different sources:

- Review of all available data, including management systems data
- Sought and received extensive public input on needs and priorities for funding
- Review of modal needs (included in Chapter V)

This information was used to develop a list of potential projects and program's priorities based on cost, project effectiveness and readiness, regional significance and community support. For the prioritittzation of projects the CMMPO used a three-step process. In the first step, projects and initiatives were grouped into programs. The second step considered how well they address measures within the CMMPO performance management goals and were scored based on the ten federal emphasis areas of: safety, security, state of good repair, congestion, multi-modality, GHG/sustainability, equity, economic development, resiliency and travel and tourism.

In the third step, those projects identified as potential major infrastructure projects were combined into two scenarios which placed the projects into financially-constrained five-year bands for implementation through 2040. These scenarios were then analyzed in the Travel Demand model, and assessed for:

- congestion reduction and savings in vehicle miles travelled
- greenhouse gas effects
- geographic equity
- environmental justice benefits and burdens
- consistency with prior public input

The CMMPO and CMMPO Advisory Committee members reviewed all project options. The recommended list of major infrastructure projects chosen by the CMMPO is included at the end of this chapter. Moreover, given the multiple array of needs in the region, a list of priorities by programs is also included in this chapter. The priorities were presented to the public on April 17, 2019 where they had the opportunity to choose their top 3 priorities.

Analysis of Major Infrastructure (MI) Projects & Initiatives

In order to develop a listing of Major Infrastructure (MI) projects that have the strong potential to be implemented through 2040, the CMMPO started with the existing MI project listing, as amended, reflected in the 2016 version of *Mobility2040*, shown in Table VI-1.

Table VI-1: Existing Mobility2040 Highway-Related Major Infrastructure (MI) Projects

Recommended Implementation Schedule	Project Name	Project Score	Project Cost (in millions)	Current Status
2016-2020	Rte 20 Oxford (Rte 20/12 to Richardson's Corner)	Rte 20 modernization with median barrier and intersection improvements Charlton/Oxford	$5.62	Programmed CMMPO TIP FY 2020 & 2021
2021-2025	Rte 9 improvements from Rte 9/I-495 interchange to Rte 9/Crystal Pond Rd intersection	Enhance safety and capacity improvements along Rte 9	$11.40	MAPC Region (*Suggested Removal*)
	Rte 20 Oxford (Rte 20/12 to Richardson's Corner)	Rte 20 modernization with median barrier and intersection improvements Charlton/Oxford	$51.31	Programmed CMMPO TIP FY 2020 & 2021
	I-90 (MassPike)/I-495 Interchange	Major interstate interchange reconstruction follows removal of toll barriers	$270.00	CIP Inclusion MAPC Financial Plan
	Route 9 – West Brookfield	2.1 mile segment of rural highway requires widening by 10' to address safety and accommodate bicycles and pedestrians	$15.40	Programmed CMMPO TIP FY 2023 & 2024
2026-2030	-Vacant-	N/A	N/A	
2031-2035	I-290/Vernon St/Kelley Sq Bridge Expansion – Worcester	Reconstruction & widening of Vernon St (Rte 122A) bridge over I-290 and related ramp work	$23.84	MassDOT Bridge Condition Monitoring
2036-2040	Rte 146/20/MassPike Interchange – Millbury	Observed congestion causes operational issues. Investigate improved signals and interchange raodways.	$29.00	MassDOT Maintenance Project, *Suggested Removal*

Staff next realized which potential MI projects would need to be scored using the CMMPO's performance management-based screening criteria. As shown below, initial MI screening ("stage zero filter") for scoring purposes was based on the following:

Already Programmed for Funding - No Scoring

- **Charlton/Oxford**: US Route 20 Corridor, *CMMPO TIP*

- **Holden/Paxton/Spencer**: Route 31 Corridor, *CMMPO TIP*
- **Hopkinton/Westborough**: I-495/I-90 (MassPike) Interchange, *MAPC TIP, MassDOT CIP*
- **West Brookfield**: Route 9 widening, *CMMPO TIP*
- **Worcester**: Kelley Square reconstruction & safety improvements, *CMMPO TIP*

Continued Monitoring - Scoring Updated

- **Millbury**: I-90 (MassPike)/US Route 20/Route 146 Interchange #10A improvements
- **Millbury/Sutton**: Route 146 Frontage Roadways between West Main Street & Boston Road
- **Northborough**: Route 9/Route 20 bridge replacement & ramp improvements
- **Southborough/Westborough**: I-495/Route 9 Interchange improvements
- **Sutton**: Route 146/Boston Road grade separation
- **Worcester**: I-290/Route 122A (Vernon Street) Interchange #13 bridge replacement
- **Worcester**: Route 20 Corridor Improvements

Candidates for Inclusion (initiatives & projects) - New Scoring

- ***Initiative*: Auburn, Oxford, Charlton, Sturbridge:** I-90 (MassPike) from I-84 to I-290 improvements
- ***Project*: Shrewsbury**: Route 20 Master Plan Corridor Improvements

Conceptual Efforts - No Scoring (perhaps revisit in the future)

- **Holden/Rutland/West Boylston:** I-190/Holden Connector Interchange/Holden Bypass, *lack of host community support for study*
- **Leicester/Oxford**: Route 56 Worcester Airport Access improvements, *deemed economically unfeasible when reviewed by MassPort*
- **Warren**: I-90 (Mass Pike)/Route 19, *lack of MassDOT support*
- **Worcester**: I-290/Route 146 interchange Exit #12, *contingent with Exit #13 monitoring*

Alternate future-year MI options were also provided for consideration by the CMMPO. Again, all MI scoring is performance-based, very similar to the CMMPO's continually evolving and fine-tuned TIP project candidate screening process. All ten US DOT federal transportation planning emphasis areas are fully addressed either through the requirements of PM1, PM2 and PM3 as well as locally-derived measures customized by the CMMPO for a broad range of areas.

Project Screening

The CMMPO has developed a strategy to effectively use transportation investments to meet the identified needs of users in the region. To inform its decisions, the CMMPO seeks public input about various investments and assesses how different packages of investment strategies and projects could advance the CMMPO's vision and goals. The CMMPO applied its goals and objectives as criteria to qualitatively evaluate the candidate projects. Table VI-2 shows the goals and objectives the CMMPO uses in analyzing projects. The goals and objectives in bold are federally required.

TABLE VI-2

REGIONAL TRANSPORTATION PLAN GOALS & MEASURES

Goal I: a. Reduce number and rate of fatal and serious injury crashes. b. increase the safety and security of the region • **# of fatalities** • **Rate of fatalities** • **# of serious injuries** • **Rate of serious injuries** • **# of non-motorized fatalities and serious injuries** • # of communities with pre-disaster mitigation plans • # of communities with evacuation routes	Goal IV: a. Expand the bicycle, pedestrian, and transit network in the region. b. Implement Complete Streets Policies in the region • Miles of pedestrian and bicycle facilities • Reduction of drive alone commute mode • # of communities with Complete Street Policies
	Goal V: a. Reduce on-road mobile source emissions. b. Encourage compact mixed-use development. • **On road mobile source emissions in kg per day from CMAQ projects** • Jobs to housing ratio
Goal II: a. To maintain the highway infrastructure asset system in a state of good repair b. Improve transportation accessibility for all modes by improving roadway infrastructure • **% of Interstate NHS Pavement in Good Condition** • **% of Non-Interstate NHS Pavement in Good Condition** • **% of Interstate NHS Pavement in Poor Condition** • **% of Non-Interstate NHS Pavement in Poor Condition** • **% of NHS Bridge Deck Area Classified as Good Condition** • **% of NHS Bridge Deck Area Classified as Poor Condition** • # of pavement sidewalk miles in poor condition • Increase the number of ADA compliant ramps in the region	Goal VI: Achieve geographic and population equity across the region • % of EJ block groups intersecting WRTA fixed route service • % of sub region per capita that benefits from a TIP project
	Goal VII: To reduce the burden of transportation costs commuting to jobs and other essential services. • Cost of transportation relative to income
	Goal VIII: Create a transportation network that is resilient to the impacts of stormwater. • TIP projects include Nature-Based solutions for stormwater management • # of culverts that are replaced or retrofitted

REGIONAL TRANSPORTATION PLAN GOALS & MEASURES

Goal III: a. To achieve a significant reduction in congestion on the National Highway System b. Reduce travel delay through IT c. Manage congestion with increases in population • **LOTTR on both Interstate and non-Interstate NHS** • **TTTR on both Interstate and non-Interstate NHS** • **% of non-single occupancy vehicle travel** • **Peak hour excessive delay** • **Emissions reduction** • # of ITS in region • # of congested miles per capita	Goal IX: To enhance the access, safety and effectiveness of the region's transportation network that serves places of touristic value. • Continue to partner with local governments, chambers of commerces, and tourism groups to provide a connected, safe and efficient transportation system for local attractions

The list of nine projects that made it to the major infrastructure listing were at first analyzed based on the aforementioned needs and then based on cost, effectiveness, readiness, regional significance and community support. The projects were then scored using the Performance Measures criteria created from the 10 federal empahasis areas. These areas are safety, security, state of good repair, congestion, multi-modality, GHG/sustainability, equity, economic, resiliency and travel/tourism. Based on these 10 areas, CMMPO staff determined what type of scoring criteria to use for each performance measure and objective. Table VI-3 shows the criteria that were used to score the Major Infrastructure (MI) highway projects. Following the criteria table, Table VI-4 shows the scoring results for the nine projects. The highest possible score a project could receive is 29 points.

As shown in Table VI-4, the highest scoring project was Shrewsbury Route 20 with a score of 21 points. The next two highest were Worcester Route 20 with 19 points and Worcester I-290/Vernon Street/Kelley Square bridge with a total of 18 points. The two lowest scoring projects were Westborough/Southborough I-495/Route 9 Interchange with 10 points and Millbury/Sutton Frontage Road on Route 146 with only nine points. The staff also presented the scoring of the projects to the CMMPO and CMMPO Advisory Committee members.

TABLE VI-3

Regional Performance Measures
Project Scoring Criteria

	OBJECTIVE	TARGET/MEASURE	Scoring
SAFETY	Reduce the Incidence of Crashes with Resultant Casualties	Reduce Number and Rate of Injuries and Deaths	X - if project will help reduce vehicle/freight crashes
	Improve Safety along Freight Routes	Reduce Number and Rate of Injuries and Deaths along Primary Freight Routes	X - if project has an identifed HSIP crash cluster
SECURITY	Enhance Security Preparedness and Coordination	Evacuation Routes Established; Preparedness Campaign Complete	X - if it is a secondary established evacuation route XX - if it is a primary established evacuation route
STATE OF GOOD REPAIR	Improve Accessibility for all Modes	Increase ADA-Compliant Ramps	X - project is improving existing ADA ramps XX - project is building new sidewalks and ADA ramps
	Maintain the Condition of the Region's Roadways	Improve Roadways and Sidewalks to a Good Condition	X - project is improving roadway pavement X - project is improving existing sidewalks
	Maintain Condition of Bridges	Increase % of Bridges by Deck Area in Good Condition & Reduce % of Bridges by Deck Area in Poor Condition	X - project is rehabilitating or replacing a bridge X - project is rehabilitating or replacing multiple bridges
CONGESTION	Achieve a Significant Reduction in Congestion	Reduce Delay along Congested Road Segments; Improve LOS at Identified Intersections and Install ITS Infrastructure	X - improving existing signalized intersection or add ITS components XX - installing new signalized control or roundabout
MULTIMODALITY	Expand the Bicycle, Pedestrian and Transit Network in the Region	Increase Bike Lane Mileage and Infrastructure; Improve accessibility to Bus Routes	X - project is increasing bike lane mileage and infrastructure X - project is improving accessibility to fixed route transit
	Increase the Number of Communities with Complete Streets Policies	Incorporate Complete Streets Prioritaztion Plan Roadways into TIP Projects	X - if the community has the project roadway included in its approved prioritization plan
GHG/SUSTAIN	Combat sprawl and its effects	Project provides opportunities to avoid, minimize, or mitigate environmental effects in a PDA area	X - If the project is within a PDA area X - project includes extensive environmental mitigation work
	Reduce Emissions	Reduce On-Road Mobile Source Emmissions from CMAQ Projects	X - project is potentially eligible for CMAQ funding X - project includes improvements that meet more than one of the CMAQ eligibility criteria
EQUITY	Assure that Improvements are Fairly Distributed among Populations and Subregions	Equitable TIP Project Distribution; Increase Percent of Vulnerable Population that can Access Transit Service	X - project is in an identified EJ or vulnerable population area X - project is within a rural area
ECONOMIC	Improve Truck Travel Time Reliability	Reduce Delay along Established Primary Freight Routes	X - project is along an established primary freight route X - project is reducing average freight delay
	Make Employment Opportunities Accessible and Available Allowing for Job Expansion and Reducing Transportation Costs	Improve the Multi-Modal Transportation Network Near Major Employment Centers	X - project improves bike, ped, or transit near major employment center XX - project improves bike, ped & transit near major employment center
STORMH2O MGMT	Create a Transportation Network that is Resilient to the Impacts of Stormwater	Use Nature-Based Solutions for Stormwater Management; Replace or Retrofit Culverts that have either Moderate, Significant, or Severe Barriers	X - project is improving vulnarable stormwater infrastructure X - project is within a identified 100 or 500 year flood zone
TRAVEL & TOURISM	Enhance region's travel and tourism opportunities	To improve traveler access, mobility and linkages to sites of touristic value and balance the travel demand needs of area residents and visitors	X - project has a tourist attraction/recreational area within project limits X - project is improving the mobility to/from these tourist attractions/recreational areas

X = 1pt, XX = 2pts

TABLE VI-4

Performance Management Assessment for Major Infrastructure (MI) Highway Projects

(Highest Possible Score is 29)

Project	Safety	Security	State of Good Repair	Congestion	Mult-Modality	GHG/ Sustainability	Equity	Economic	Stormwater	Travel & Tourism	Total Score
Shrewsbury – Route 20	2	2	4	2	2	2	1	3	1	2	**21**
Worcester – Route 20	2	2	6	1	1	2	1	3	1	0	**19**
Worcester – I-290/ Vernon St/ Kelley Sq Bridge	2	2	4	1	2	2	1	2	0	2	**18**
Northborough – Route 9/ Route 20 Interchange	2	2	5	0	1	0	1	3	0	0	**14**
Sutton – Route 146/ Boston Rd Interchange	1	2	3	2	1	2	1	2	0	0	**14**
Auburn/Charlton/ Sturbridge – MassPike	2	2	1	1	0	1	1	2	1	2	**13**
Millbury – Route 146/Route 20/ MassPike Interchange	2	2	0	2	0	2	0	2	1	0	**11**
Westborough/ Southborough – I-495/Route 9 Interchange	2	2	3	0	0	0	1	2	0	0	**10**
Millbury/Sutton – Frontage Rd on Route 146	0	0	2	2	1	2	1	0	1	0	**9**

Selected MI Highway Project Listing

The CMMPO selected the final highway-related MI project listing following a detailed scoring and prioritization effort. The CMMPO considered a number of factors including:

- Performance Management-based scoring
- Host community and/or MassDOT support
- Travel Demand Model results
- Design Readiness, *through ongoing MassDOT monitoring, design status updates*
- Project Cost, *mindful of financial constraint requirements*
- Regional Significance

The recommended MI project listing, that also includes a major study initiative, is summarized in Table VI-5 and shown in Figure VI-1. MI projects were placed in financially-constrained, five-year bands based on the funding reasonably anticipated to be available to the planning region. These future-year funding estimates were provided by MassDOT-OTP for the purposes of the LRTP update process. Subsequently, the CMMPO and CMMPO Advisory Committee agreed to the placement of the various MI projects into the future year time bands. As limited regional target funding might be applied to address these identified MI needs in the future, modestly-sized projects are specifically included in the new listing crafted for the LRTP 2020 Update.

Table VI-5: Major Infrastructure (MI) Highway-Related Projects

Financially-constrained Listing

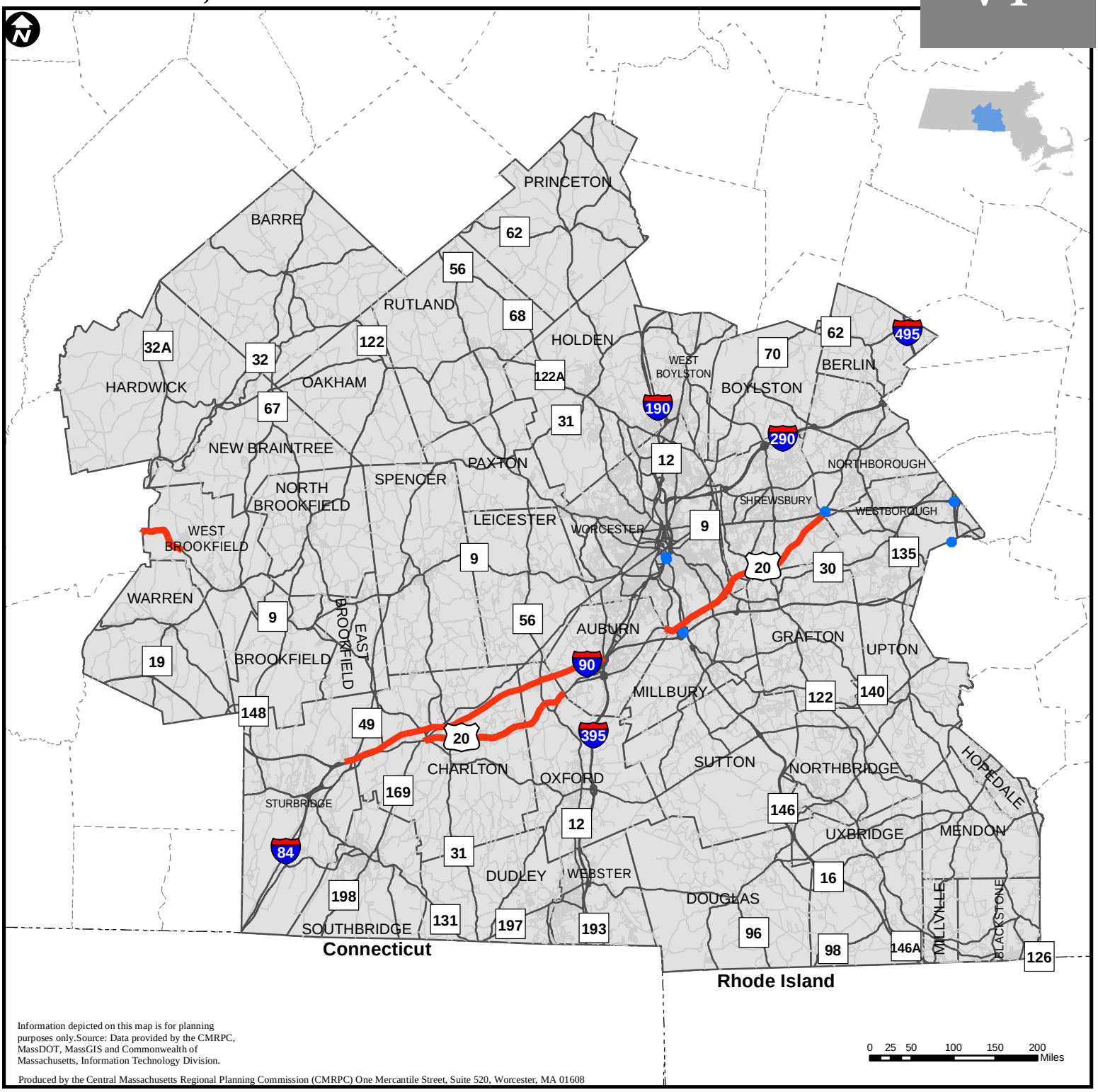
Suggested Implementation Time-Band Schedule	Project Name & Host Community	Project Scope	Project Cost (in Millions)	Comments/Observations	CMMPO TIP Fiscal Years
2016-2019	Reconstruction of Kelly Square, Worcester	Installation of peanut-style roundabout to increase safety, reduce congestion and better accommodate bicyclists & pedestrians	$14.000	Recently amended into CMMMPO TIP for FY 2019 using statewide HSIP and STP funding	2019
2020-2024	Route 20 (Route 20/12 to Richardson Corners), Charlton/Oxford	Route 20 modernization with median barrier and intersection improvements including new quadrant roadway at Route 56	$73.821	CMMPO Target Funding : $11.387	2020 & 2021
	INFORMATION ONLY: I-495/I-90 (MassPike) Interchange Reconstruction, Hopkinton/Westborough	Reconstruction of Major Interstate System Interchange to reduce congestion & increase safety	$270.000	MassDOT CIP inclusion; reflected in Boston Region Financial Plan	2022-2026
	Route 9, West Brookfield	Widening of 2.1 mile segment of rural highway by 10' to address safety and accommodate bicycles & pedestrians	$13.389	Phase 1: $6.674, Phase 2: $6.715	Phase 1: 2023, Phase 2: 2024
2025-2029	I-495/Route 9 Interchange, Southborough/Westborough	Bridge Reconstruction & installation of "Braided Ramps"	$30.000	MassDOT Freight Plan support	TBD
2030-2034	I-290 Exit 13/Route 122A (Vernon St) Bridge Replacement, Worcester	Reconstruction & widening of Route 122A (Vernon Street) bridge over I-290 and related ramp work	$30.000	Post-Kelly Square reconstruction monitoring	TBD
2035-2039	Route 20 - Worcester/Shrewsbury	Implement aspects of Route 20 Master Plans	$30.000	Seek to increase safety through reduction of bottleneck conditions	TBD
2040 & Beyond	Route 9/Route 20, Northborough	Bridge replacement	$30.000	Bridge condition monitoring continues on periodic basis	TBD

MassDOT Maintenance Activities

Continued monitoring of recurring congestion	MassPIke (I-90)/Route 146/Route 20 Interchange, Millbury	Observed congestion causes operational issues, espcially weave for Route 146 SB ramp to MassPike entrance	$5.000	D-3 suggests minor improvements, such as new signal installation, completed through ongoing maintainance activities	TBD

Initiative: Study Effort

Continued monitoring of recurring congestion	MassPIke (I-90) between I-84 & I-290/I-395, Sturbridge, Charlton, Oxford, Auburn	Observed chronic congestion along with defined crash clusters. Parallel Route 20 often used as alternate route impacting host communities.	$500K	Consultant study suggested to consider targeted ITS applications to address safety issues and other known deficiencies	TBD



Information depicted on this map is for planning purposes only.Source: Data provided by the CMRPC, MassDOT, MassGIS and Commonwealth of Massachusetts, Information Technology Division.

Produced by the Central Massachusetts Regional Planning Commission (CMRPC) One Mercantile Street, Suite 520, Worcester, MA 01608

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Figure VI-1 Highway-Related Major Infrastructure (MI) Projects and Initiatives

- Mobility2040 MI Locations
- Mobility2040 MI Corridors
- CMRPCTowns

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Conceptual Efforts

Overview

A number of *conceptual* highway-related Major Infrastructure (MI) projects, either legacy concepts from earlier planning work or those raised through the public outreach process, are included in *Mobility 2040* for information purposes only and are ***not*** included in the financially-constrained MI project listing. Presently, it appears all are beyond the LRTP horizon year 2040. Accordingly, these conceptual improvement ideas were ***not*** scored to determine a Performance Management potential. However, these longer-range visions for the major highway network serving the region have the potential for future year consideration. At such time, the transportation planning staff could decide to more thoroughly investigate these potential conceptual improvement options.

Four conceptual highway-related improvements have been identified. Details concerning each have been provided, including as to why these future year visions are not being pursued at this time. They are as follows:

Holden/Rutland/West Boylston: I-190/Holden Connector Interchange/Holden Bypass

As part of the preparatory efforts made prior to the LRTP Update for 2020, staff compiled a detailed "Memorandum" concerning the idea of an I-190 connector and associated bypass of Holden's Main Street corridor, Route 122A. The Memorandum is included in the LRTP's accompanying Technical Appendix. A conceptual improvement idea with a long history, including a number of previously prepared studies, this vision presently lacks host community support. When recently asked, community leadership in each the towns declined the opportunity to compete for an updated study of this improvement concept.

Leicester/Oxford: Route 56 Worcester Airport Access Improvements

Studied about a decade ago as part of the Worcester Regional Mobility Study (WRMS) that was funded by MassDOT and prepared by the CMMPO staff, this idea considered a new interchange on Route 56 with the MassPike (I-90) in Oxford. This new interchange could provide access to Route 56 (Huntoon Highway) along with a potential bypass of Route 56 on the easterly side of Leicester. Here access to the Airport could be made in some manner on the western side Airport property. When discussed in detail with a MassPort board member, the idea was deemed economically unfeasible at the time. This conceptual improvement idea has not been pursued since that time.

Warren: I-90 (Mass Pike)/Route 19

This legacy idea envisions a new MassPike (I-90) interchange with Route 19 at the existing overpass adjacent to the MassDOT maintenance depot. However, beyond the significant challenges of planning, securing funding and constructing a new interchange on the Interstate System, Route 19 would require improvements as well. It appears this would be the case not only in the environs of the envisioned new interchange, but likely along lengthy sections of Route 19 in the host communities of Warren and adjoining Brimfield, in the PVPC planking region. At this time, considering vast needs identified elsewhere in the state, a new Route 19 interchange with the MassPike lacks MassDOT support.

Worcester: I-290/Route 146 Interchange Exit #12

This idea was brought forth during the extensive public outreach process that shaped the development of the LRTP Update for 2020. No direct ramp exists between Route 146 northbound and I-290 westbound. Currently, traffic proceeds from Route 146 northbound to I-290 eastbound and uses Interchange #13 at Route 122A (Vernon Street), to reverse direction and gain access to I-290 westbound.

With the pending reconstruction of adjacent Kelly Square, MassDOT will continue ongoing monitoring of traffic operations at the interchange. As is highlighted elsewhere in the document, the replacement of the Route 122A bridge over I-290 is included as a financially-constrained future-year, highway-related Major Infrastructure (MI) project. The eventual replacement of the bridge will commence based on a number of factors, most importantly bridge condition, as well as the traffic operations on the interchange ramps, Route 122A as well as a reconstructed Kelly Square. Again, in the interim, MassDOT plans to continue monitoring traffic operations at Interchange #13.

Travel Demand Modeling Analysis

Under the Highway project options the CMMPO decided on two options for analysis. Option 1 and 2 would be analyzed with all the major infrastructure projects as decided from the 2020 to 2035 year bands. Option 1 will include the Millbury project in MA-146 / U.S. 20 / I-90 Exit 10 interchange in the 2035-2039 year band. Whereas Option 2 will include the U.S. 20 Shrewsbury / Worcester corridor reconstruction project in the 2035 to 2039 year band.

Staff performed various analyses using the travel demand model to analyze the congestion and vehicle miles travelled reductions, GreenHouse Gas impact analysis, Environmental Justice benefits and burdens analysis, Geographic Equity Analysis and Public Input on the presented

options. Also the transit projects were included as part of the analysis to capture the maximum extent of the impact of each of the options in a multi-modal way. The two options that were analyzed are shown below in Table VI-6.

Table VI-6: Major Infrastructure Project Options for Analysis

Recommended Implementation Schedule	Project Name	Project Scope	Current Status	Option
2020	Worcester Kelley Square reconstruction			1&2
2021-2025	Charlton/Oxford Route 20 (Rte 20/ 12 to Richardson Corner)	Rte 20 modernization with median barrier and intersection improvements, Charlton/Oxford	Per TIP schedule (Should be no build already)	1&2
	I-90 (MassPike)/I-495 Interchange	Major Interstate Interchange reconstruction follows removal of toll barriers	CIP Inclusion, MAPC Financial Plan	1&2
	Route 9 – West Brookfield	2.1 mile segment of rural highway requires widening by 10' to address safety and accommodate bicycles and pedestrians	Per TIP schedule (Should be no build already)	1&2
2026	I-495/Rte 9 Interchange reconstruction	Make better connections from Rte 9 interchange to the I-90 interchange	From last RTP	1&2
2031	I-290/Vernon St/ Kelley Square Bridge Expansion – Worcester	Reconstruction & widening of Vernon St (Route 122A) bridge over I-290 and related ramp work	From last RTP	1&2
2036	Route 146/20/ MassPike Interchange – Millbury	Observed congestion causes operational issues. Investigate improved signals and interchange roadways.	From last RTP	1
2036	Route 20 widening-Worcester/Shrewsbury	Make the corridor a consistent four lane section throughout the entire corridor in Worcester and Shrewsbury	New option for this RTP	2

Scenarios

The travel demand model was used to analyze all five project options to understand the benefits of each of the options in terms of reduction in congestion and savings in vehicle miles travelled. The 2018 model was run to understand the current conditions and it is used as the baseline. The first scenario refers to the year 2040 with no major infrastructure projects, or the 2040 No-Build scenario. This scenario helps to understand the forecasted impact of land use changes in the region and the impacts of such changes in the transportation network if no major infrastructure is build.

The second and third scenario are two options of the 2040 Build, or an scenario in which all the major infrastructure projects are built as recommended, except the options listed in the 2035-2040 timeframe. This scenario was ramified in two options. By having two options in the 2035-2040 timeframe helps determine which potential transportation improvement project will result in major benefits for the region. In summary, all scenarios were compared to the current conditions or baseline, which refers to the 2018 conditions. The baseline do not include the TIP projects programmed in the 2019-2023 TIP years.

- **Scenario 1:** 2040 No-Build (includes the projects programmed in the endorsed 2019-2024 TIP)
- **Scenario 2:** 2040 Build Option 1 – All major infrastructure projects from 2020 to 2034 and MA-146 and US 20 interchange improvement project in the 2035-2039 year band.
- **Scenario 3:** 2040 Build Option 2 – All major infrastructure projects from 2020 to 2034 and Worcester/Shrewsbury US 20 improvement project in the 2035-2039 year band.

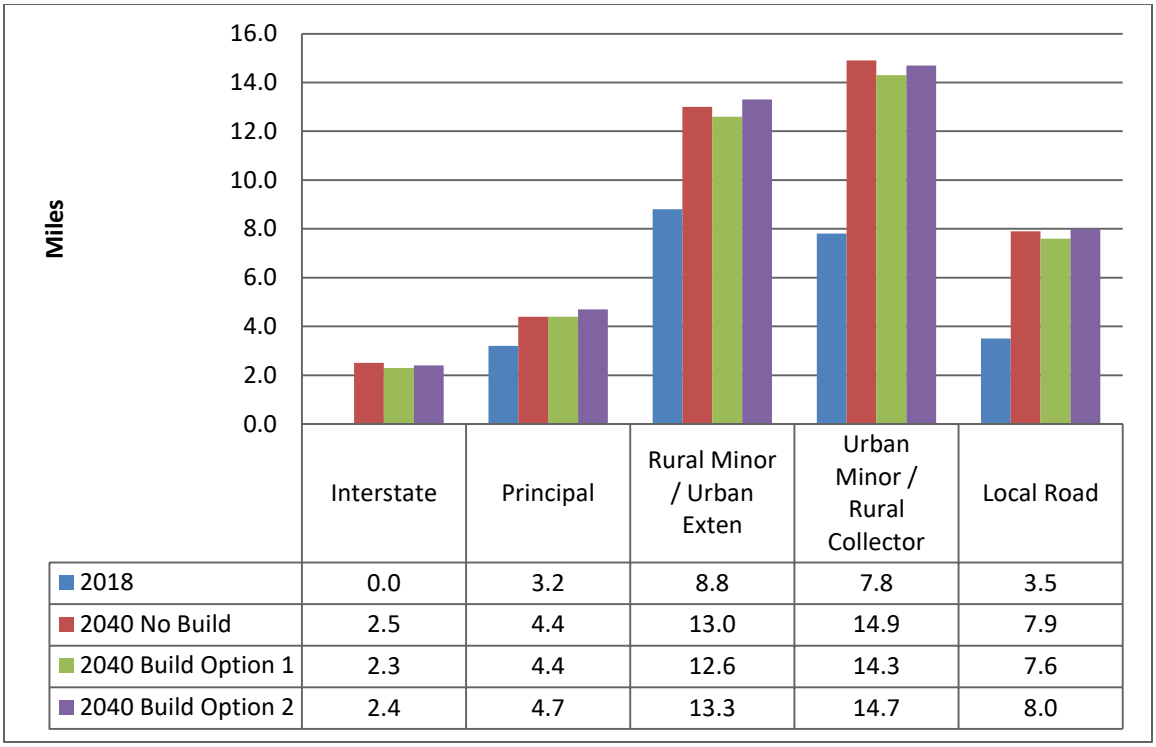
As shown in Table VI-7, Current Conditions or Baseline for 2018 No Build shows a total of 24.6 miles of congested roadways and 13,532,797 vehicle miles traveled. Whereas the 2040 No-Build scenario estimates a total of 47.5 miles of congested roadways, almost double compared from the Baseline and an increase of 15.6% in vehicle miles traveled, 15,643,341.

The two options were compared to the 2040 No-build scenario to calculate the net benefit from each of the options. There's no significant difference between the two options in terms of increase in VMT and or congested VMT. As shown in Figure VI-2, it is important to note that the highest impact in miles of congested roads will be in urban collector roads and rural minor roads. To shift the expected trend will require a combination of transportation demand management (TDM) strategies, major transit investments, and the implementation of transportation systems management and operations (TSMO) strategies.

Table VI-7: Results from the Travel Demand Model Scenario Analysis

	Scenarios			
	2018 No Build	**2040 No Build**	**2040 Build Option 1**	**2040 Build Option 2**
Total VMT	13,532,797	15,643,341	15,649,028	15,646,290
Congested VMT	1,074,995	1,403,175	1,387,950	1,389,926
VMT per Square Mile	35,985	40,062	40,074	40,049
Heavy Truck VMT per Square Mile	2,353	2,565	2,564	2,563
Miles of Congested Roads	24.6	47.5	44.9	47.9

Figure VI-2: Miles of Congested Roads by Road Classification



	Interstate	Principal	Rural Minor / Urban Exten	Urban Minor / Rural Collector	Local Road
2018	0.0	3.2	8.8	7.8	3.5
2040 No Build	2.5	4.4	13.0	14.9	7.9
2040 Build Option 1	2.3	4.4	12.6	14.3	7.6
2040 Build Option 2	2.4	4.7	13.3	14.7	8.0

Public Input

A major effort was done to gather public input in a myriad of ways throughout the development of Mobility2040: The update for 2020. One of the interactions with the public included the prioritization of projects based on the needs identified. As part of the prioritization exercise, the public was aked to identify their top three (3) priorities from a list of identified projects, one (1) being the top priority. Related with major infrastructure projects, the public choose the I-90 (MassPike) and I-495 interchange reconstruction in Westborough and Hopkinton. This project is included in the State's Capital Improvement Plan. The second

priority was the I-495 and MA-9 interchange reconstruction. The third priority was the U.S. 20 reconstruction in the Town of Shrewsbury and the City of Worcester. An Economic Development Master Plan is being developed in an effort to identify future demand along this corridor and it potential impact in the transportation network.

Geographic Equity

Geographic equity, in this case, refers to the equal distribution of projects among the six CMMPO subregions. The measure used for this analysis was the number or percentage of major infrastructure projects in each subregion and the per capita investment by sub-region.

Based on the results included in Table VI-8, Option 2 has a more equitable distribution of projects and regional discretionary target funds per capita compared to Option 1. In summary, the $232.1 million in regional discretionary target funds are spread around the region. The North sub-region with only two projects already programmed in the 2020-2024 TIP, has the smallest share in both options, $12.0 million or 5% of the total regional discretionary target funds, and an investment of $241.86 per capita.

In Option 1 the largest share, $83.1 million, or 36% is in the Southeast sub-region, with a per capita investment of $755.50, much higher than the region's average, $411.6 million per capita. Whereas in Option 2, the largest share, $72.5 million , or 31% of the total regional discretionary target funds is in the Central sub-region (Worcester). The investment per capita is $395.09, closer to the region's average.

Table VI-8: Geographic Equity Analysis

Regional Discretionary Target Funds

(including Programmed Projects)

OPTION 1

Subregion	Population	# of Projects	Total Cost	Per capita	Proportion
North	49,770	2	$12.0 M	$241.86	0.05
Northeast	77,166	1	$30.0 M	$388.77	0.13
West	46,383	4	$27.3 M	$587.98	0.12
Central	183,382	4	$57.6 M	$277.30	0.22
Southwest	97,960	5	$28.7 M	$293.47	0.12
Southeast	111,192	7	$83.1 M	$755.50	0.36
TOTAL	**565,853**	**23**	**$232.1 M**		**1.00**

OPTION 2

Subregion	Population	# of Projects	Total Cost	Per capita	Proportion
North	49,770	2	$12.0 M	$241.86	0.05
Northeast	77,166	2	$51.6 M	$668.69	0.22
West	46,383	4	$27.3 M	$587.98	0.12
Central	183,382	5	$72.5 M	$395.09	0.31
Southwest	97,960	5	$28.7 M	$293.47	0.12
Southeast	111,192	6	$40.8 M	$366.98	0.18
TOTAL	**565,853**	**24**	**$232.1 M**		**1.00**

The following Figure VI-3 shows the Major Infrastructure projects within the CMMPO sub-regions.

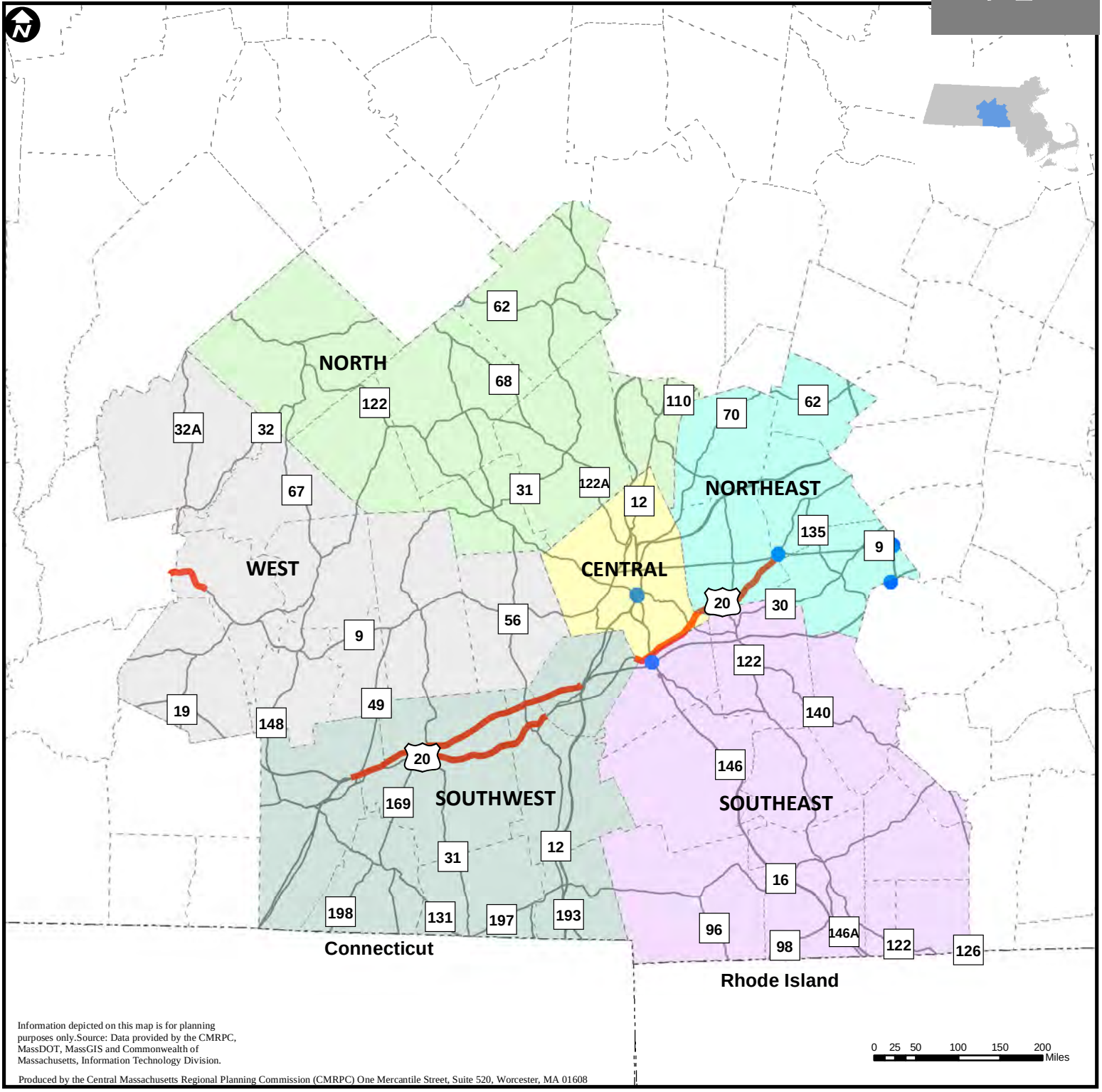


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Figure VI - 3 Major Infrastructure in CMMPO Sub-Regions

SUBREGION

- NORTHEAST
- SOUTHWEST
- CENTRAL
- SOUTHEAST
- WEST
- NORTH
- Mobility2040 MI Locations
- Mobility2040 MI Corridors

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Title VI, Environmental Justice and Other Vulnerable Population

Title VI of the Civil Rights Act of 1964, also referred as Title VI for short, prohibits discrimination in federally assisted programs and requires that no person in the United States of America shall, on the grounds of race, color, or national origin, including limited English proficiency (LEP), be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity receiving federal assistance. The Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) regulations expand Title VI to prohibit discrimination on the basis of age, sex, and disability.

Environmental Justice is the ***fair treatment*** and ***meaningful involvement*** of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (Executive Order I2898 – February 1994). The principles include the following: 1) to ensure the full and fair participation process; 2) to avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects; and 3) to prevent the denial of, reduction in, or significant delay in the receipt of benefits.

The environmental justice populations include minority and low income populations. It is the CMMPO's role to identify environmental justice populations' needs and make the necessary efforts to engage them so that they are part of the decision-making process. The CMMPO uses data from the 2015 5-year American Community Survey (ACS) data. The CMMPO Environmental Justice definition reads as following:

A U.S. Census Block Group will be denominated as a "Neighborhood of Environmental Justice Concern" (NEJC) if complies with any of the following criteria:

Low income population – Block Groups (2015 ACS) where the median household income is less than or equal to 65% of the regional median (65% * $69,078 = $44,901).

Minority population – Block Groups where the percentage of minority population is greater than or equal to the regional proportion of minority population, 22.2%. Minority population includes persons who are American Indian and Alaska Native, Asian, Black or African American, Hispanic or Latino, and Native Hawaiian and other Pacific Islander.

Likewise, the CMMPO identifies other vulnerable populations as a means to expand project outreach activities and identify possible mitigation efforts, including protected populations under Title VI. Still, the CMMPO reassures its intention to be flexible adding more criteria if necessary, depending on projects' characteristics or local knowledge of a given location. The

thresholds for other vulnerable population were set at 150% of region's average. This allows the identification of areas with thresholds above the average and to be inclusive, but discrete based in resources available. Other vulnerable populations include the following:

Zero Vehicle Household – Refers to the occupied housing units (owner or renter occupied) without a vehicle available. In the CMMPO region 9.0% of all occupied housing units don't have a vehicle available. A Census Block Group is considered an NEJC if the proportion is equal or greater than 13.5% (150% higher than the region's).

Linguistically Isolated Household – Is a household in which all members 14 years old and over speak a non-English language and also speak English less than ''very well.'' No one 14 years old or older speaks only English. In the CMMPO region, 5.8% of all households are linguistically isolated. A Census Block Group is considered an NEJC if the proportion is equal or greater than 8.7% (150% higher than the region's).

Elderly Population – For the CMMPO, an elderly population refers to those households in the region with a person 75 years of age or older. In the region, 6.2% of all households have at least one person 75 years age or older. A Census Block Group is considered an NEJC if the proportion is equal or greater than 9.3% (150% higher than the region's).

Households with one or more persons with a disability – The proportion of households in the region with one or more persons with a disability is 23.8%. A Census Block Group is considered an NEJC if the proportion is equal or higher than 35.7% (150% higher than the region's).

For Mobility2040, the CMMPO Environmental Justice definition was used to determine the possible impacts on the population for all the options for Major Infrastructure Projects. For this purpose, staff used Geographic Information Systems (GIS) to view and tabulate demographic information. The unit of geographic analysis used was Census Block Groups in conformity with the CMMPO definition of NEJC. These maps are a valuable visualization tool used to depict the proposed Major Infrastructure projects in relation to the region's NEJC. Also, the maps include all mappable projects. Projects such as bridges or intersections were mapped as points, whereas other road-related projects were mapped as lines. A one-mile radii buffer was done for each the features. If the project's buffer intersects a block group with either low-income population, minority population or other vulnerable populations, the project was considered to be located in a NEJC area for the purpose of this analysis. (See Figure VI-9)

Table VI-9 shows that all major infrastructure projects included in the two options impact a vulnerable population within a Neighborhood of Environmental Justice Concern (NEJC). With the exception of the US-20 improvement project in the towns of Charlton and Oxford, all

projects are located within one mile from a minority or low income NEJC. In addition, the projects in Kelley Square, both the MA-122 bypass and the bridge expansion over I-290, show a very diverse environmental justice population composition within the one-mile buffer zone.

This initial analysis make planners aware of the need to tailor outreach activities for each one of these major infrastructure projects according to the populations identified in this buffer zone. As projects move forward to the design phase, the analysis become more refined and will allow the identification and engagement of other vulnerable populations not initially identified. Following the table, Figure VI-4 and Figure VI-5 show the EJ and Vulnerable Populations layers along with the Major Infrastructure projects.

Table VI-9: Environmental Justice Criteria by Major Infrastructure Highway Project

Major Infrastructure Projects	Environmental Justice Populations		Vulnerable Populations			
	Minority Population	Low Income Population	Elderly Population	Zero-Vehicle House-holds	Linguistically Isolated Households	Households with 1 or more persons with a disability
West Brookfield MA-9 Reconstruction		X	X			
Worcester Kelley Square Reconstruction	X	X	X		X	X
Oxford / Charlton US 20 Reconstruction			X			X
Westborough / Hopkinton I-90 / I-495 Interchange		X				
Westborough / Southborough I-495 / MA-9 Interchange		X			X	
Worcester I-290 / MA-122 Vernon Street Bridge Replacement	X	X	X		X	X
Shrewsbury / Worcester US 20 Reconstruction	X	X		X	X	X
Millbury MA-146 / US 20 / I-90 Interchange						X

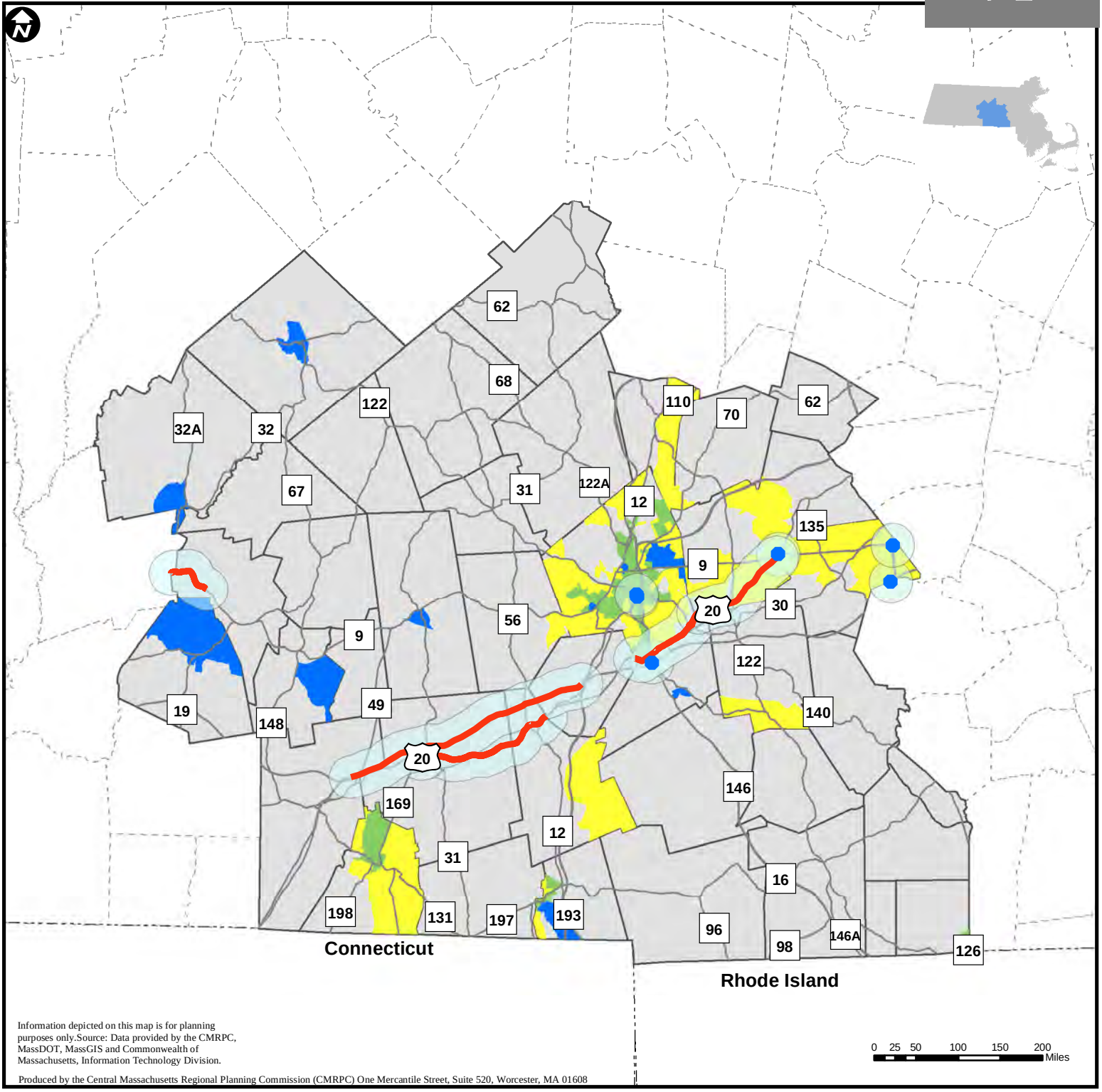

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Figure VI - 4 Major Infrastructure within 1-mile of EJ Populations

Legend

- Mobility2040 MI Locations
- Mobility2040 MI Corridors
- Mobility 2040 MI Buffer
- CMRPCTowns

Environmental Justice Populations

- Low Income (< 65% of Median Household Income: <$44,901)
- Minority (>Regional Percent Minority: >22.2%)
- Minority and Low Income

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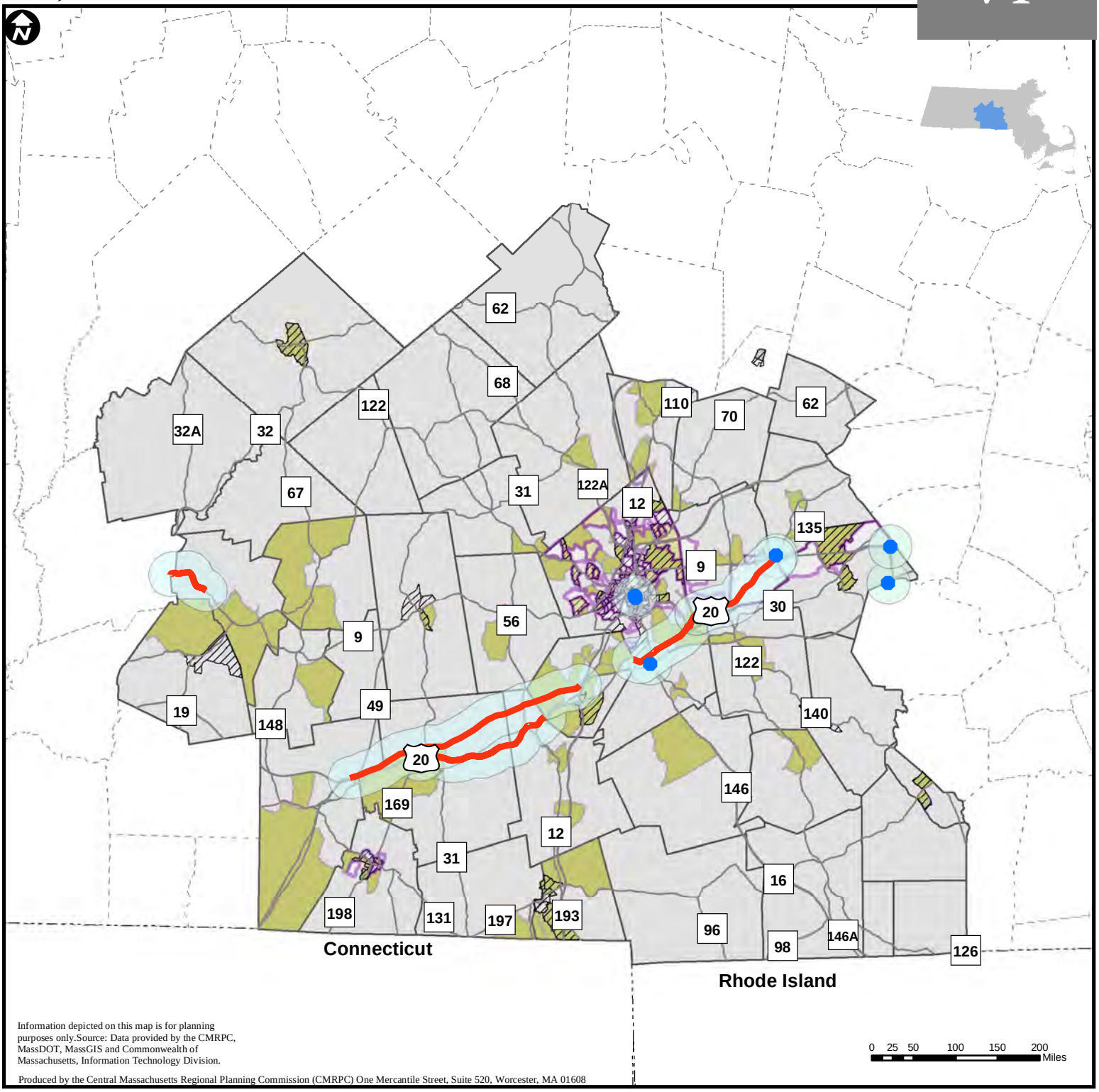

Figure VI - 5 Major Infrastructure within 1-mile of Vulnerable Populations

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Legend

- Mobility2040 MI Locations
- Mobility2040 MI Corridors
- Mobility 2040 MI Buffer
- CMRPCTowns

Vulnerable Populations

- Population over 75 (Greater than 150% of regional average: 9.3%)
- Linguistically Isolated Households (Greater than 150% of region average: 9.45%)
- Zero Vehicle Households (Greater than 150% of regional average: 13.5%)

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It is important to note that these criteria does not determine the feasibility or desirability of a project more than other, it is only a method to know at early planning stages if a transportation project will likely impact environmental justice populations and or vulnerable populations. This method makes transportation planners aware of the need to avoid such impacts, minimize or to mitigate any foreseeable impacts. Also, it is an initial tool that assists future outreach efforts. These efforts need to be refined as the planning process and future implementation develops. In addition, environmental effects of projects proposed for Federal funding must comply with the National Environmental Policy Act (NEPA) process. The NEPA review is a more detailed assessment on the potential human or natural environmental effects. The NEPA assessment includes human health, economic and social effects on minority and low-income populations.

Benefits and Burdens Analysis

The Victoria Transport Policy Institute defines Equity as "the distribution of impacts (benefits, disadvantages and costs) and whether that distribution is considered fair and appropriate." Current regulations mandate different types of analysis in order to prevent foreseeable impacts to the population as a result of a transportation project. Equity principles permeate in transportation planning when the analyses include possible impacts to disadvantage populations and measures to avoid, minimize or mitigate such impacts. Mobility2040: The Update for 2020 incorporates equity in the Central Massachusetts long range transportation planning process by measuring different facets of equity according to federal provisions and planning emphasis areas for each of the options for major infrastructure projects.

A Benefits and Burdens Analysis is "an evaluation comparing impacts likely to be experienced by EJ populations against those likely to be experienced by non-EJ populations and the community as a whole in order to address any disproportionate benefits or burdens between EJ populations and the population at large." (FTA C 4703.1, August 15, 2012) A disproportionate burden is defined as an impact predominantly borne by a minority population or low-income population, will be suffered by the minority and/or low income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the non-minority population and or the non-low income population.

Furthermore, the FHWA requirements for Title VI Program (23 CFR Part 230) requires recipients to collect statistical data and establish procedures to identify and eliminate discrimination when found to exist. Title VI Analyses are grounded on the basis of disparate impacts. A disparate impact is a statistical demonstration that a facially neutral policy or practice caused a

significant, adverse impact based on race, color, national origin, sex, disability, or another protected basis.

It is important to note that there's no one-size-fits-all type of approach to determine benefits or disproportionate burdens or disparate impacts from transportation projects. The Travel Demand Model outputs were used as the main source of data to determine if any disproportionate burdens and/or disparate impacts could result from the proposed scenarios. For the purpose of this analysis, the results for environmental justice traffic analysis zones (TAZs) or EJ areas were compared with those from the non-environmental justice traffic analysis zones (non-EJ areas). The analysis include the following criteria:

- Vehicles mile traveled (VMT)
- Congested vehicle miles traveled (VMT)
- Average production and attraction time by transit and highway
- Number of jobs within 20 minutes by highway
- Number of jobs within 40 minutes by transit

For this purpose, the CMMPO considered three main scenarios, the 2040 No-Build Scenario against the baseline or current conditions and the 2040 Build Scenario against the baseline. The Build Scenario included the two options previously mentioned.

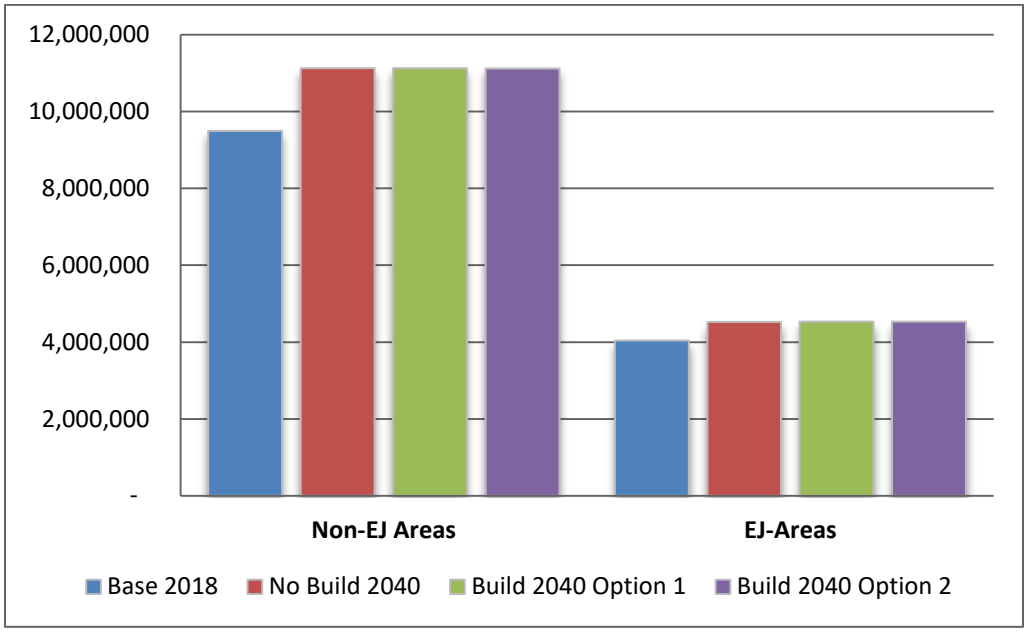
Vehicle Miles Traveled (VMT)

As shown in Table VI-10 and Figure VI-6, the CMMPO's vehicle miles traveled (VMT) baseline is 13,532,797, of which 9,489914 (70.1%) are in non-EJ areas; whereas 4,042,883 (29.9%) are in EJ areas. Based on the model, the VMT in the region is expected to grow 15.6% by 2040.

Table VI-10: Total Vehicle Miles Traveled (VMT) in EJ and non-EJ areas

	Non-EJ Areas	EJ-Areas	Total VMT
Base 2018	9,489,914	4,042,883	13,532,797
No Build 2040	11,118,893	4,524,448	15,643,341
Build 2040 Option 1	11,118,592	4,530,436	15,649,028
Build 2040 Option 2	11,116,094	4,530,196	15,646,290

Figure VI-6: Total Vehicle Miles Traveled (VMT) in EJ and non-EJ areas



The VMT in non-EJ areas is 2.45 times higher than in EJ areas in all options. It is important to note that most of EJ areas are located within a transit service area compared to the non-EJ areas that do not have mobility options, hence, automobile-dependent areas. By 2040, the proportion of VMT in EJ areas remains fairly the same compared with the baseline.

Congested Vehicle Miles Traveled (VMT)

As shown in Table VI-11, the congested vehicle miles traveled (VMT) baseline for the CMMPO region is 1,074,995, or 7.9% of the region's total VMT. The baseline for congested VMTs in non-EJ areas is 434,318 (40.4%), whereas in the EJ-areas is 640,677 (59.6%).

Table VI-11: Total Congested Vehicle Miles Traveled (VMT) in EJ and non-EJ areas

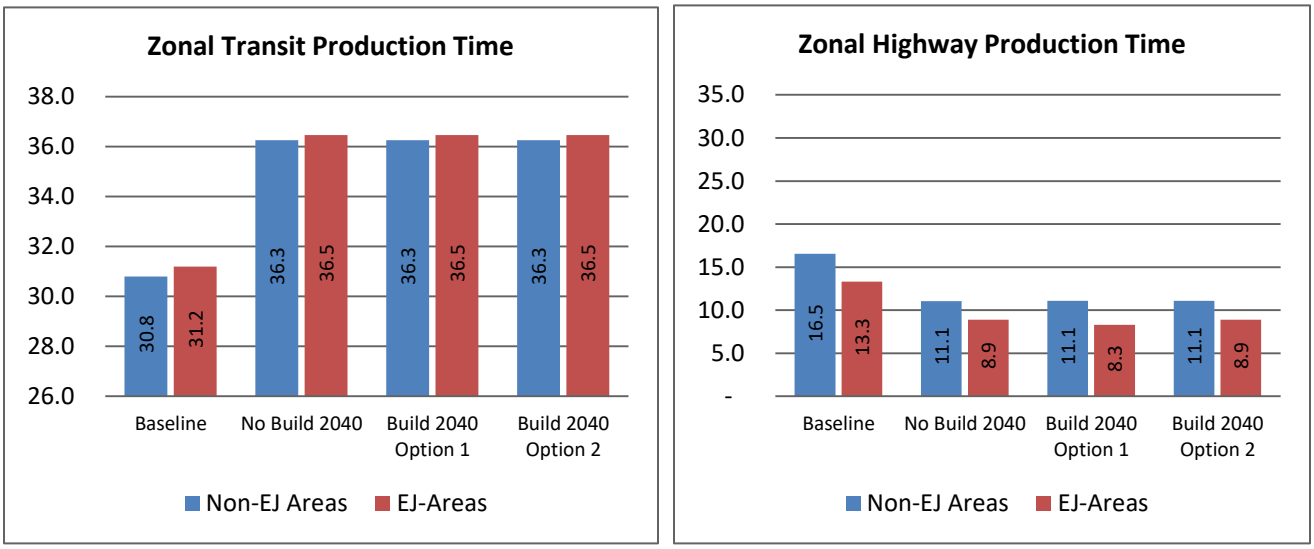
	Non-EJ Areas	EJ-Areas	Total VMT
Base 2018	434,318	640,677	1,074,995
No Build 2040	602,430	800,746	1,403,175
Build 2040 Option 1	597,727	790,223	1,387,950
Build 2040 Option 2	596,581	793,345	1,389,926

Both scenarios, the 2040 Build Option 1 and Option 2 show a higher number of congested VMT in EJ areas compared to the non-EJ areas, which is consistent with the baseline. What's relevant from these figures, is that the EJ-areas will have a higer share of congested VMT compared with the non-EJ areas.

Average Production and Attraction Times

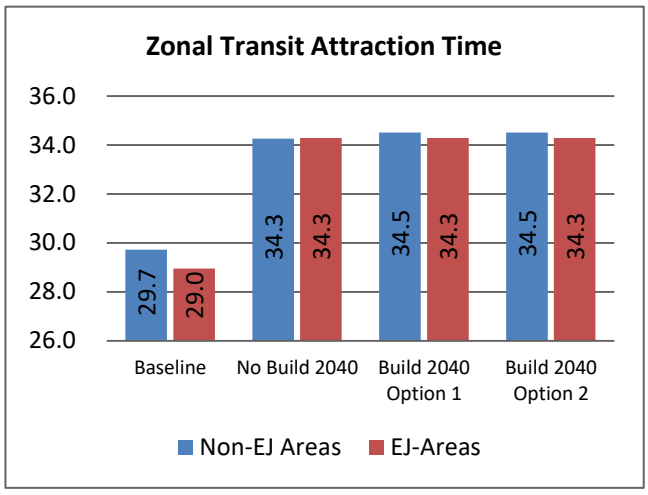
The zonal production time and attraction time was calculated for each TAZ for transit and highway. There's no significant difference between non-EJ areas and EJ areas in the baseline zonal transit production time. As shown in Figure VI-7, non-EJ areas is 30.8 minutes, whereas in EJ areas is 31.2. Nonetheless, by 2040, the model shows an increase 36.3 minutes in non-EJ areas, and 36.5 minutes in EJ areas. The zonal highway production time baseline for non-EJ areas is 16.5 minutes and for EJ areas is 13.3 minutes. By 2040, the production time decreases. In the non EJ areas to 11.1 minutes and in the EJ areas to 8.9 minutes.

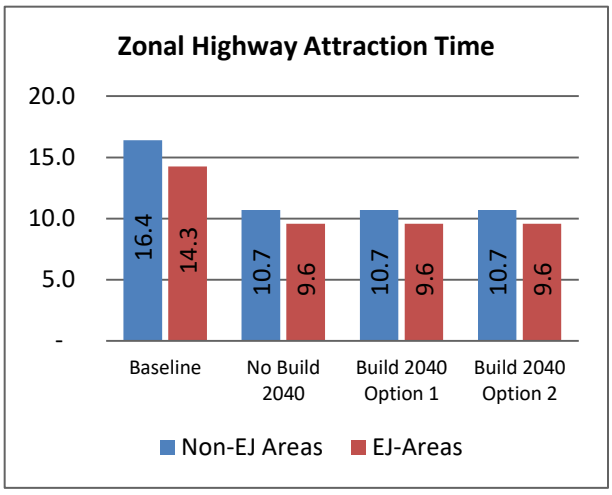
Figure VI-7: Zonal Production Times



The same applies to the attraction times. As shown in Figure VI-8, the baseline zonal transit attraction time in non-EJ areas is 29.7 minutes and 29.0 minutes in the EJ-areas. But again, by 2040, the zonal attraction time by transit increases to 34.3 minutes in both, EJ and non-EJ areas. The zonal highway attraction time by 2040 shows a decrease, consistent with the baseline. The baseline zonal highway attraction time is 16.4 minutes in non-EJ areas and 14.3 minutes in EJ areas. The trend continues in 2040, with 10.7 minutes in non-EJ areas and 9.6 minutes in EJ areas. The decrease is fairly the same in EJ and non-EJ areas regardless of the options.

Figure VI-8: Zonal Attraction Times

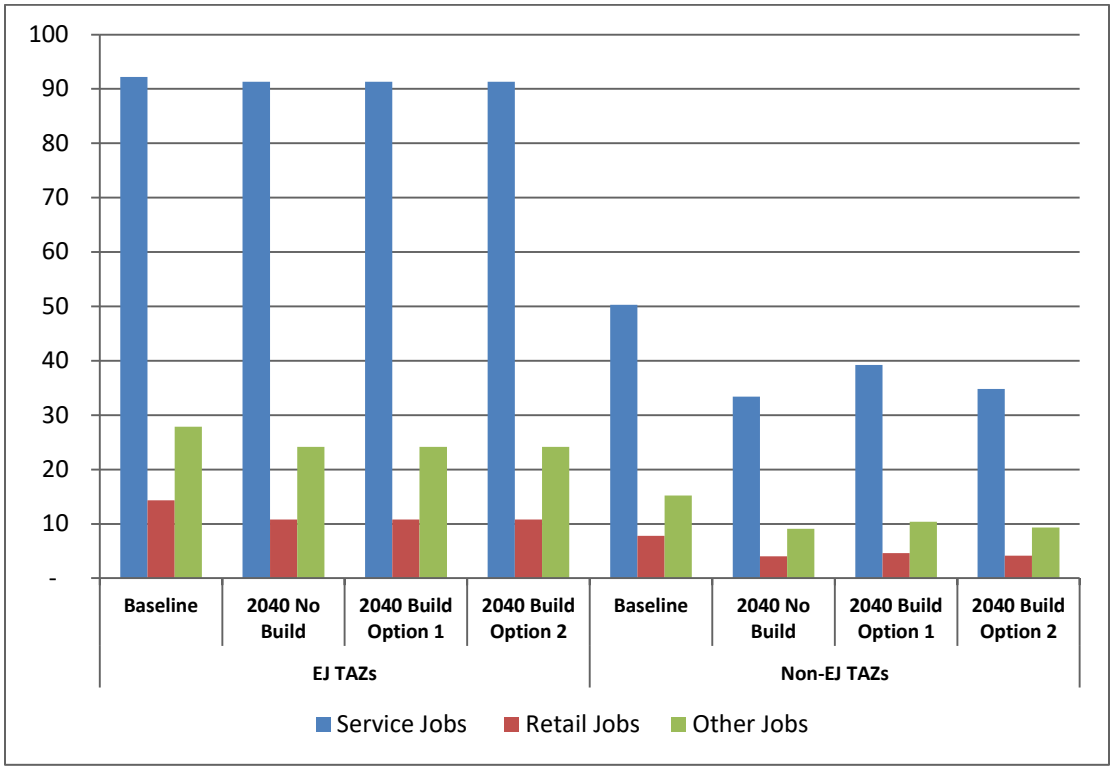




Number of Jobs Accessible within 20 minutes by Highway

In EJ areas, the baseline for the CMMPO region shows an average of 134 jobs per person within 20 minutes by highway. The majority of these jobs are on the service industry (68.6%). Retail jobs account for 10.6% of all jobs, or 14 jobs per person within 20 minutes by highway. In non-EJ areas, the average number of jobs per person is 73 jobs. As mentioned in Chapter 1, employment in the region is forecasted to grow 2.6% by 2040, whereas population growth is forecasted at 12.0%. Given these assumptions, by 2040 the average number of jobs per person within 20 minutes by highway will decrease 6% in EJ areas, an average of 126 jobs per person; and 25% in non-EJ areas, an average of 55 jobs per person, regardless of the options, built or no built. The takeaway from this output is that people from non-EJ areas will have to drive longer distances to access jobs. The proportion of service jobs by 2040 will slightly increase. Telecommuting should be evaluated as an alternative given the expected growth in service jobs and the potential impact on VMT in the region. This information can be seen in Figure VI-9.

Figure VI-9: Number of Jobs within 20 Minutes by Highway in EJ and non-EJ areas



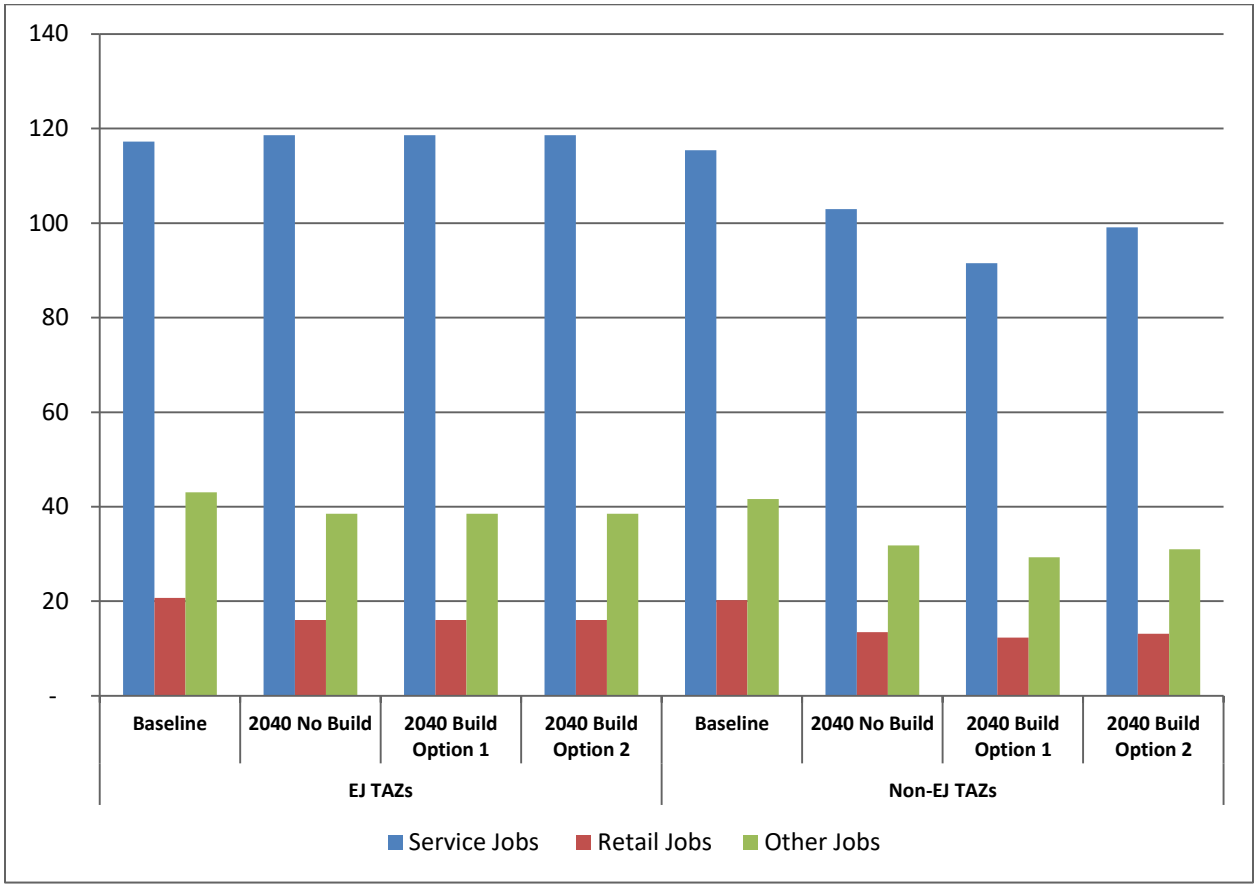
Number of Jobs Accessible within 40 minutes by Transit

The average number of jobs available per person by transit was also calculated with the model. Transit includes fixed-route and commuter rail. In EJ areas, the baseline for the CMMPO region shows an average of 181 jobs per person within 40 minutes by transit. The majority of these jobs are on the service industry (64.8%). Retail jobs account for 11.4% of all jobs, or 21 jobs in average per person within 40 minutes by transit. In non-EJ areas, the average number of jobs per person is 177 jobs. By 2040 the average number of jobs per person within 40 minutes by transit will decrease 4.3% in EJ areas, an average of 173 jobs per person; and 24% in non-EJ areas, an average of 134 jobs per person, regardless of the options, built or no built. As mentioned, earlier, transit options are more prevalent in EJ areas.

Nonetheless, the data shows that non-EJ areas can access in average 2.4 more jobs by transit than by highway. As it stands today, two of the three existent commuter rail stations in the region are in non-EJ areas. As mentioned in Chapter 1, almost a third of the workers that live in the CMMPO region commutes East, the I-495 corridor, the eastern boundary of the region, is the fastest growing industrial corridor in the state, and based on the *Future of Transportation* Report, the City of Worcester is considered a Gateway City in the central Massachusetts region. All these factors combined reckons commuter rail service enhancements, including improving

efficiencies, adding capacity, including parking and amenities, alongside with the implementation of transit oriented development policies around the commuter rail stations could also impact the expected growth in VMT. The same applies to fixed-route transit service and the implementation of flex-lanes and transit signal priority (TSP) to improve efficiencies and on-time reliability in combination with passenger amenities like transfer stations or mini-hubs, shelters, real-time information, wi-fi, among other amenities. Other opportunities should explored, like catering services to employers with a regional pool of employees and explore alternatives to create transportation management associations (TMA) in the region. This information is shown in Figure VI-10.

Figure VI-10: Number of Jobs within 40 Minutes by Transit in EJ and non-EJ areas



Summary

In summary, by 2040 there will be an increase in VMT across the region. Overall, this increase in vehicle miles traveled will be higher in EJ areas, with specific variances by town. Nonetheless, if none of the options are built by 2040, the VMT will be even higher, with major repercussions in non-EJ areas. As for EJ areas, the biggest impact will be congestion. As discussed in earlier sections of this chapter, the congested miles of roadway is expected to increase in urban

colectors and rural minor roadways. Most EJ areas in the CMMPO region are located in the urban centers close to transit-rich downtown areas, services and employment. The model outputs for the baseline show that congested VMT represents roughly an 8% of total VMT in the region, but 60% of the congested VMT occurs in EJ areas. This trend continues without significant change through 2040. The other critieria analyzed didn't show any significant difference between EJ areas and non-EJ areas and/or between the scenarios.

Greenhouse Gas (GHG) Savings

The CMMPO acknowledges that greenhouse gas emissions (GHGs) contribute to climate change and reducing GHG is a priority for the region. If climate trends continue as projected, the conditions in the CMMPO region will see an increase in storm induced flooding and warmer temperatures that would affect the region's infrastructure, economy, human health, and natural resources.

Reducing GHG in the region supports the Commonwealth's Global Warming Solutions Act (GWSA). Through the GWSA, Massachusetts is on track to reach its GHG reduction targets. Additionally, Massachusetts is in attainment for ozone, particulate matter (PM), and carbon monoxide CO (Waltham remains a maintenance area for CO). Despite these small GHG milestones, the CMMPO will continue to analyze the qualitative GHG reductions in all projects funded through the LRTP and TIP.

Although the CMMPO region is meeting the air quality standards for most air pollutants, it is important to ensure that transportation projects funded by the MPO continue to help to reduce vehicle-miles traveled (VMT), which in turn will continue to reduce air pollution in the region. The following chart shows the current plans, projects and actions done by the CMMPO to reduce GHG as well as potential plans, projects and studies that the CMMPO could do to reduce GHG. Developing the LRTP involves public outreach and consultation on what types of projects could help the region meet the goals cited during the public outreach process. During each public outreach session, staff has highlighted GHG as a byproduct of the transportation system and how increases in GHG correlates with increases in deleterious climate change effects. As the regional travel demand model has yet to provide quantitative data on GHG reduction for the potential LRTP projects, CMMPO staff has provided qualitative assessments on the anticipated GHG impacts of selected Major Infrastructure projects and how the projects could contribute towards the region and state's GHG reduction goals. The recommended plans for GHG reduction is shown in Table VI-12.

Table VI-12

Recommended Plans, Studies and Projects for GHG Reduction		
Existing Programs & Project Types		**Potential**
LRTP	Major Infrastructure projects have the potential to reduce congestion and VMTs, thus reducing GHG. Examples include the Route 20 Charlton & Oxford Rehabilitation	Develop measures for potential TIP Projects that correlates with GHG emissions from local automobile travel. One is VMT and the other is Vehicle Hours Traveled (VHT). While less used, VHT, may be a better indicator of future GHG emissions because cars emit GHG as long as they're running no matter how many VMTs.
19-24' TIP	CMAQ funded projects in the '19-'24 TIP include projects that improve operations at intersections for all vehicles and improving bicycle and pedestrian infrastructure	
UPWP	The UPWP has included programs such as Complete Streets, Corridor Profile and Traffic Bottleneck Reduction and FY19 included Bicycle and Pedestrian Plans	The CMMPO could look into developing public/private partnerships to develop Transportation Demand Management Programs (TDM) to reduce VMT, encourage car share, transit and other similar strategies.
Other Studies & Analysis	The CMMPO provides transportation related Technical Assistance to communities for their Master Plans, Access Management Plans, Traffic Counting plans to help inform our region on ways to reduce VMT, congestion and GHG	Explore opportunities to consider vulnerability and resilience in MPO-funded corridor and intersection studies

One public session in particular, the CMMPO's Annual Environmental Consultation, covers the environmental impacts from potential LRTP and TIP projects. At the session on April 2019, the planning staff stated that the projects in both the CMMPO LRTP and TIP were selected in full consideration of likely GHG impacts, among other performance-based project selection criteria. Based on the staff's qualitative analysis the overall benefit for each of the options was "moderate". The only project that would bring in huge amounts of GHG savings is the I-495/ Masspike Interchange project. Other projects have some moderate or minimal GHG savings.

Project Analysis Results

Table VI-13 summarizes the results from all the analyses done and rank the options based the results previously discussed.

Table VI-13: Ranking of Highway Project Options

	Congestion Reduction	Reduction in VMT	Benefits to EJ areas	Public Input	Geographic Equity	GHG Savings	Ranking
Option 1	1	2	2	2	2	2	2
Option 2	2	1	1	1	1	1	1

Based on the ranking tabulated above the CMMPO picked Option 2 as the preferred highway major infrastructure projects as part of this plan. The Major Infrastructure Highway Projects included in *Mobility2040: The Update for 2020* are included in Table VI-14.

Table VI-14: Major Infrastructure Highway Projects – Preferred Option

Recommended Implementation Schedule	Project Name	Project Scope
2020-2024	Rte 20 Oxford (Rte 20/12 to Richardson's corner)	Rte 20 modernization with median barrier and intersection improvements Charlton/Oxford.
	Route 9 - West Brookfield	2.1 mile segment of rural highway requires widening by 10' to address safety and accommodate bicycles and pedestrians.
2025 - 2029	I-495/Rte. 9 Interchange reconstruction	Make better connections from Rte. 9 interchange to the I-90 interchange.
2030 - 2034	I-290/Vernon St/Kelly Square Bridge Expansion - Worcester	Reconstruction & widening of Vernon Street (Route 122A) bridge over I-290 and related ramp work.
2035 - 2039	Rte. 20 widening Worcester/Shrewsbury	Make the corridor a consistent four lane section throughout the entire corridor in Worcester and Shrewsbury.

Programs Prioritization

The CMMPO has developed a set of programs to better address the region's transportation needs. Given the financially constrained environment it is imperative to prioritize the investments and scrutinize the projects based on their ability to advance the State's and the region's goals. The program structure is rooted in the outcomes or targets endorsed by the CMMPO; hence, the programs are intrinsecally geared to address multiple goals simultaneously. In addition to this, the CMMPO reflect the federal emphasis areas, the results of the management systems and the public outreach process.

It is important to note that some of the priorities identified can be addressed through the standard TIP development process, whereas in other cases it can be addressed with technical assistance provided to the host communities, or through the development of a study. More than often, initiatives require establishing partnerships and fostering commitments from several agencies and stakeholders. The following information contains the top priorities for each program area. Further, Figure VI-11 graphically displays these priorities. For estimated funding levels for each of these programs, see Chapter VII.

Asset Management and System Operations

This program addresses system reliability and state of good repair. The priorities identified on this program are the following:

Community	Description
Webster	Improving operation at MA-12 and MA-16 intersection
Holden	Improving operations of the MA-122A corridor
Greenwood Street	Maintenance and system operations from Worcester City Line to Highland Farms
Worcester	Chandler Street and Murray Ave intersection improvements to address safety
Region-wide	Truck parking initiative – identify locations for modern, full-service truck stops along major freight routes
Region-wide	Study Freight Accommodation Assessment for State Numbered Routes

During the public outreach process, the public choose the Truck Parking Initiative as the top priority to be addressed bythis program.

Livability and Healthy Transportation

Thisprogram promotes livable and healthy communities by supporting projects, initiatives and technical assistance that provide and/or enhance transportation options for all ages and abilities. The priorities identified for this program are the following:

Community	Description
Worcester	Streetscape improvements, including pedestrian and bicycle accommodations in Main Street from King Street to May Street.
Worcester	Corridor improvements in Chandler Street from Main Street to Park Ave. Including safety improvements, Safe Routes to School strategies, streetscape improvements and pedestrian and bicycle accommodations.
Southeast Sub-region	Blackstone River Greenway trail segments 2, 3, 4 and 5 and the Southern New England Trunkline Trail (SNETT) in Douglas to Uxbridge trail segment.
Worcester and Southbridge	Initiative to start a bike sharing program in these communities.
Barre	Complete Streets (Tier 3) and Safe Routes to School
Berlin	Complete Streets (Tier 3) and Safe Routes to School

During the public outreach process the top priority was the Main Street improvements from King Street to May Street. The second and priority was the bike program in the communities of Worcester and Southbridge and the third priority was the completion of the trail system in the Southeastern sub-region. In addition to the above, the public also mentioned the need to integrate the Auburn Rail Trail with safe routes to school and complete streets.

Transit Planning and Mobility Management

This program supports transit planning activities in the region, including the transit authority, WRTA, and other transportation partners, by strategically addressing regional mobility needs

for different transit-dependent populations. The priorities identified on this program area are the following:

Community	Description
WRTA Service Area	Service enhancements and paratransit efficiencies
Sturbridge	Intercity bus service
Worcester - Springfield	Commuter rail extension
Worcester	Reconstruction of Passenger Platform at Union Station
Westborough	Add parking at Westborough MBTA Commuter Rail Station with bus service enhancements and trail connections.

During the public outreach process, all the priorities above were validated. In addition to this the public mentioned the following priorities:

Community	Description
Grafton	Add parking to the Grafton MBTA Commuter Rail Station
Regionwide	Identify opportunities for new park-and-ride locations
Regionwide	Study the feasibility of same-day paratransit service
Clinton area	Improve rail access to the North and to Assabet Valley area

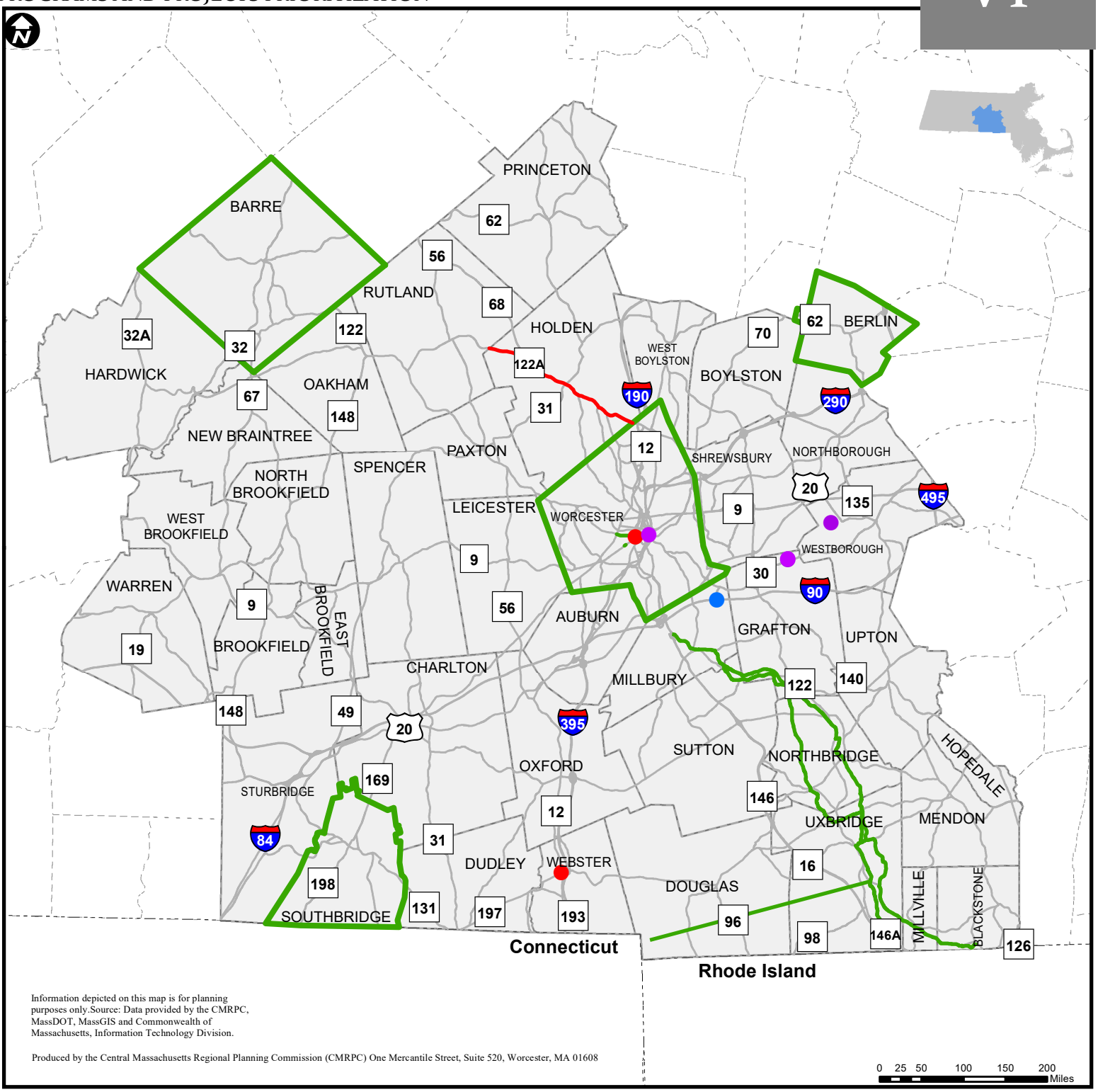
Climate Change and Resiliency

This program promotes climate change awareness by indetifying best practices and supporting the region's communities in the implementation of resilient strategies through transportation projects, initiatives and technical assistance. The priorities identified on this program area are related to congested corridors and intersections, the completion of all towns with vulnerability asessments and to address the culvert with severe barriers in the region.

Community	Description
Millbury	Address congestion at the MA-122 and I-90 (MassPike) interchange.
Worcester	Intersection improvements at the Foster Street, Green Street, Franklin Street and Francis J. McGrath Blvd.

Community	Description
Regionwide	Culvert replacement projects (severe barrier status)
Regionwide	Municipal Vulnerability Preparedness (MVP) assessments and designations

The Municipal Vulneraility Preparedness assessments and communities designations (MVPS) were identified as the main priority during the public outreach process.



Information depicted on this map is for planning purposes only.Source: Data provided by the CMRPC, MassDOT, MassGIS and Commonwealth of Massachusetts, Information Technology Division.

Produced by the Central Massachusetts Regional Planning Commission (CMRPC) One Mercantile Street, Suite 520, Worcester, MA 01608

CMMPO

CENTRAL MASSACHUSETTS Regional Planning Commission

Figure VI-11 Public Participation Program Priorities

- Livability and Healthy Transportation
- Asset Management and System Operations
- Transit Planning and Mobility Management
- Climate Change and Resiliency

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The Update for 2020

*For demonstration purposes only please refer to the full list of program needs and priorities on pages 36-38.

CHAPTER VII

Financial Plan

Constrained Recommendations

Introduction

Federal FAST Act regulations require that the long-range regional transportation plan to be a financially-constrained document. To ensure financial constraint, it is necessary to estimate the costs of all projects recommended in *Mobility2040: The Update for 2020* and to assess the amount of funds that are expected to be available over the course of the planning horizon (2020-2040) for highway projects and transit. Ultimately, the costs of the proposed projects must not exceed that of the expected funding. The mix of major infrastructure projects included in this chapter was chosen by the CMMPO based on the analysis included in the previous chapter.

Other funding sources that supplement the regional discretionary funds have been identified because there is not enough expected revenue to meet all the needs, and not all the projects identified in the needs analysis can be included in the Financial Plan.

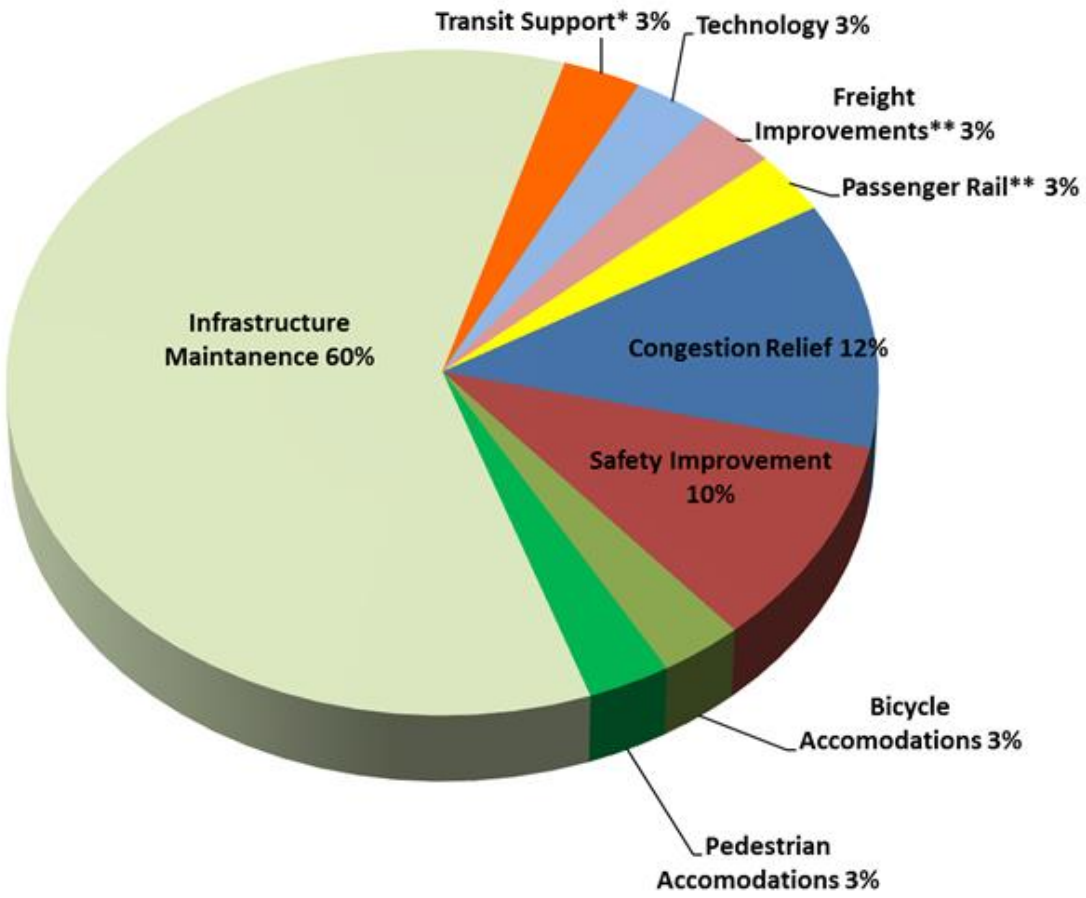
Financial Considerations

The relevance of the efficiencies in the transportation network is a crucial element for the CMMPO given the limited funding, competing priorities, and the comprehensive list of unmet needs. The former *Mobility2040* included a breakdown of the expected planned funding options and how it was envisioned to be allocated. See Figure VII-1 for reference.

The former *Mobility2040* planned funding options distribute the regional target funding through the Transportation Improvement Program amongst the following programs:

- Infrastructure Maintenance – 60%
- Congestion Relief – 12%
- Safety Improvement – 10%
- Bicycle Accommodations – 3%
- Pedestrian Accommodations – 3%
- Passenger Rail Enhancements** – 3%
- Freight Improvements** – 3%
- Transit Support* – 3%
- Technology – 3%

Figure VII -1: Mobility2040 Planned Funding Options



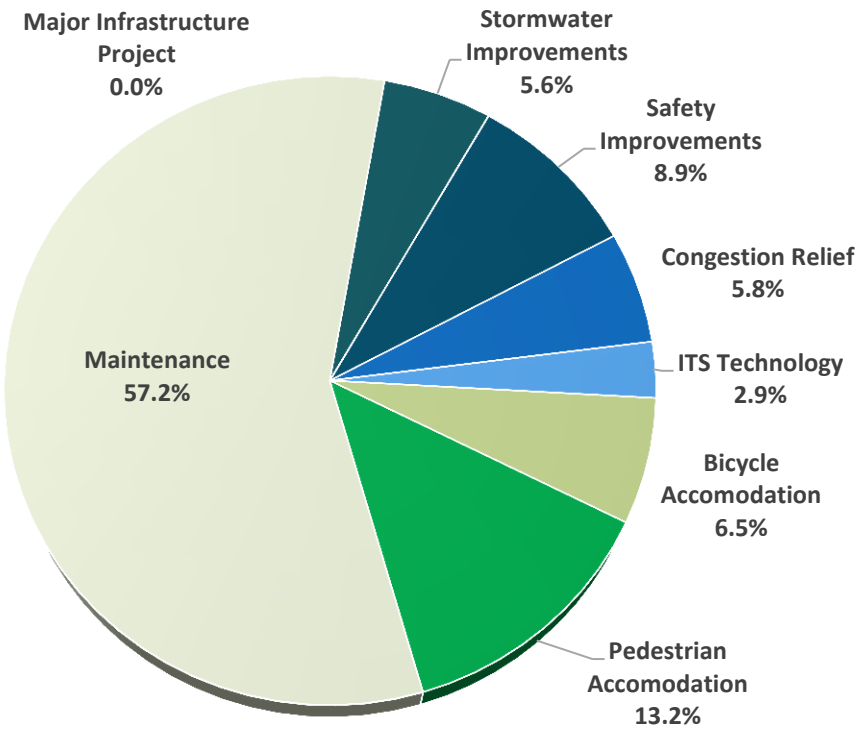
* - i.e., (Park-n-Ride, TSP/Signal Coordination, Corridor Improvement, TMA support)

** - Initiatives/Studies, last mile connections etc.

During the period of 2015 to 2018 a total of $227.5 million of dollars were programmed through the CMMPO Transportation Improvement Program (TIP) process. The projects programmed during this period address a number of major goal areas and help the region achieve performance measures and targets. Moreover, a closer look to the total programmed funds in the CMMPO region show that the overall programming of projects followed the path delineated in the endorsed Mobility2040. See Figure VII-2 for reference.

During this period a wide array of projects were programmed, with the exception of major infrastructure projects. A new category of projects included during this period on the TIP was stormwater improvement. Also, pedestrian and bicycle accommodation projects exhibit a high percentage due to the earmarked projects that required completion during this period.

Figure VII – 2: 2015-2018 TIP's Total Programmed Funds



Funding Options

As shown in Figure VII-3, the CMMPO was presented with two funding options by program areas:

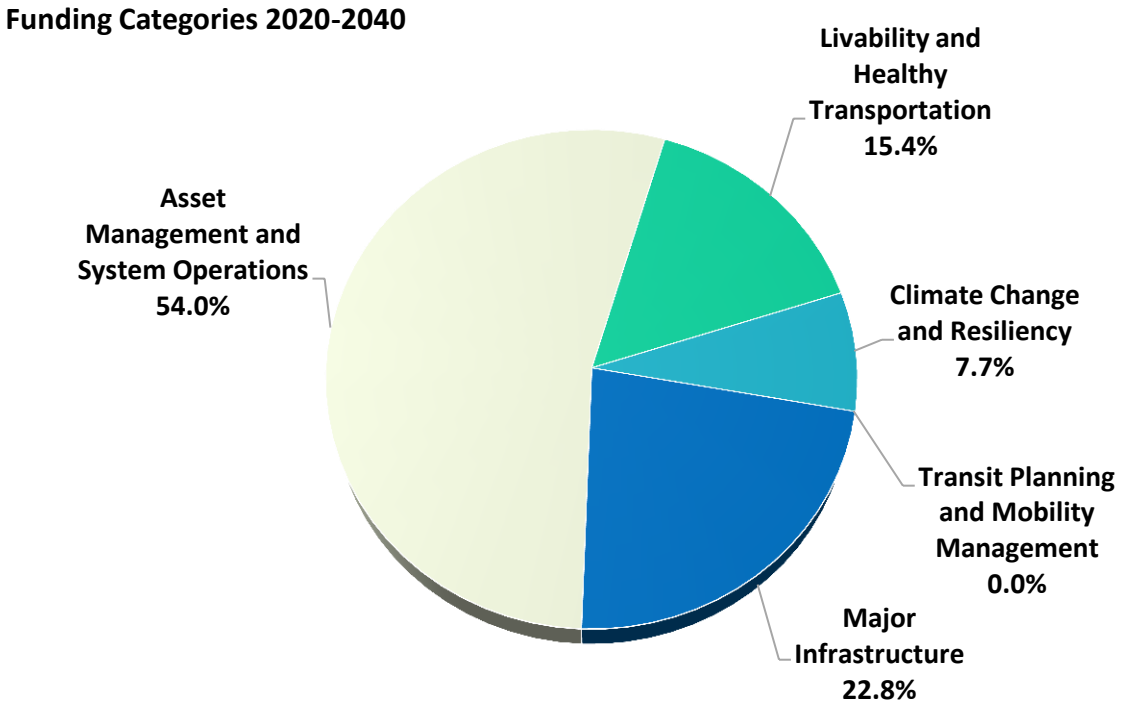
- Asset Management and System Operations
- Livability and Healthy Transportation
- Climate Change and Resiliency
- Transit Planning and Mobility Management
- Major Infrastructure Program

Both options are fairly the same, with the exception that Option 1 does not allocate funds to the Transit Planning and Mobility Management, whereas Option 2 allocates 3.8% to this program. In both options the funding allocation for Major Infrastructure Program represents 22.8% of total regional discretionary funds. For the Climate Change and Resiliency Program it represents 7.7% and includes 4% for congestion mitigation, 2% for stormwater improvements and 1% for culvert replacements and retrofits. The Livability and Healthy Transportation Program allocations represent 15.4% of total regional discretionary funds, divided between 6%

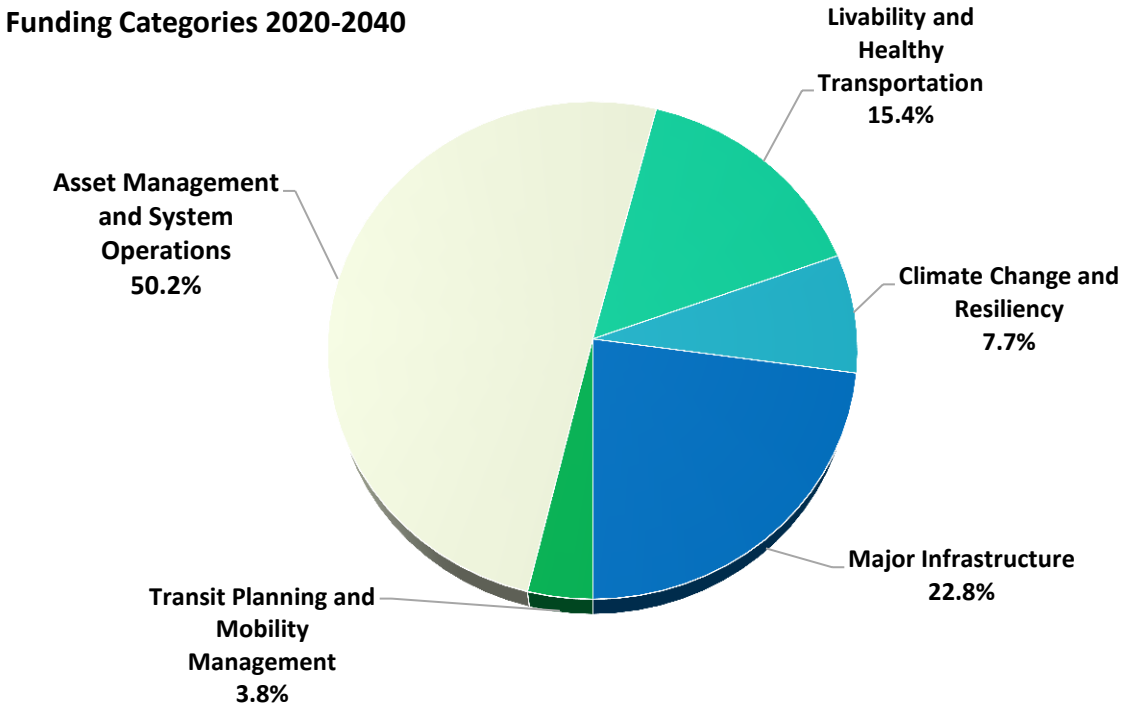
each, pedestrian and bicycle accommodations, and 3% for trails. The major change was in the Asset Management and System Operations Program. Option 1 allocates 54.0% to this Program, but Option 2 allocates 50.2%. In both options this program includes Maintenance at 25%, Information Technology Systems at 3% and Freight Improvements at 3%. Safety improvements have a reduction of 1% in Option 2, from 8% to 7%. Also, system operations and intersection improvements funding allocations is 15% in Option 1 and 12% in Option 2. It is important to note, that the major infrastructure projects already programmed and soon to be programmed address all program areas in one or more aspects.

Figure VII-3: Funding Options

OPTION 1



OPTION 2



Upon review of the two options, and with consideration of public input received, the CMMPO chose Option 2 as the preferred funding scenario. This option will maintain and operate the current system at optimal efficiency. Also, transit support strategies among other management and operation methodologies such as ITS, Transportation Demand Management strategies, Park and Ride lots, Transit Signal Priority, and Corridor Management strategies such as signal coordination will help the region reach its goals of improving mobility, reducing greenhouse gases, improving sustainability and promoting economic development.

In summary, *Mobility2040: The Update for 2020* planned funding options distributes the regional target funding through the following programs:

- Asset Management and System Operations – 50.2%
- Livability and Healthy Transportation – 15.4%
- Climate Change and Resiliency – 7.7%
- Transit Planning and Mobility Management – 3.8%
- Major Infrastructure Program – 22.8%

Major Infrastructure Projects

Highway-Funded Projects

Projected Revenue

The major source of funding for highway-related projects are apportionments provided through the Federal Highway Administration (FHWA). These funds typically provide 80% of project funds, with the remaining 20% coming from a state match. Federal funds are usually derived from gasoline tax revenues, and state funds from the Transportation Bond Bill which is paid through by either gasoline tax revenues or general tax funds.

FAST Act has provided federal transportation funding in the recent years. To estimate federal funding starting on 2020, the MassDOT-Office of Transportation Planning (OTP) developed programming assumptions based on guidance from FHWA, and provided these estimates to each MPO region in Massachusetts. The breakdown of estimated highway revenue available for programming in the CMMPO region is included in Table VII-1.

Table VII - 1

FFY 2020-2040 Estimated Regional Transportation Plan Highway Funding Available

	2020-2024 (Programmed in TIP until 2024)	2025-2029	2030-2034	2035-2039	2040	Total
Total Highway Revenue Available for Programming	**$ 388,819,507**	**$ 441,039,648**	**$ 532,397,594**	**$ 586,164,396**	**$ 124,291,148**	**$ 2,072,712,291**
Bridges	$ 85,618,141	$ 97,397,010	$ 119,590,913	$ 132,548,680	$ 28,192,846	$ 463,347,590
National Highway System	$ 37,049,429	$ 44,102,934	$ 54,152,690	$ 60,020,176	$ 12,766,175	$ 208,091,403
Interstate Maintenance	$ 17,329,380	$ 21,882,318	$ 26,868,652	$ 29,779,891	$ 6,334,125	$ 102,194,366
Non Federal Aid Preservation (bridges and roadways)	$ 43,450,500	$ 44,406,411	$ 45,383,352	$ 46,381,786	$ 9,480,437	$ 189,102,486
Statewide Infrastructure	$ 97,539,214	$ 109,619,482	$ 134,598,526	$ 149,182,380	$ 31,730,802	$ 522,670,404
Regional discretionary Funding (O&M and Major Infrastructure)**	**$ 107,832,843**	**$ 123,631,493**	**$ 151,803,461**	**$ 168,251,483**	**$ 35,786,763**	**$ 587,306,042**

** Expected Transportation Improvement Program funding

The estimated regional transportation plan regional discretionary funding available for the period of 2020 to 2040 is $587,306,042. The regional discretionary funding for the first year band of 2020-2024 is already programmed in the endorsed 2020-2024 TIP.

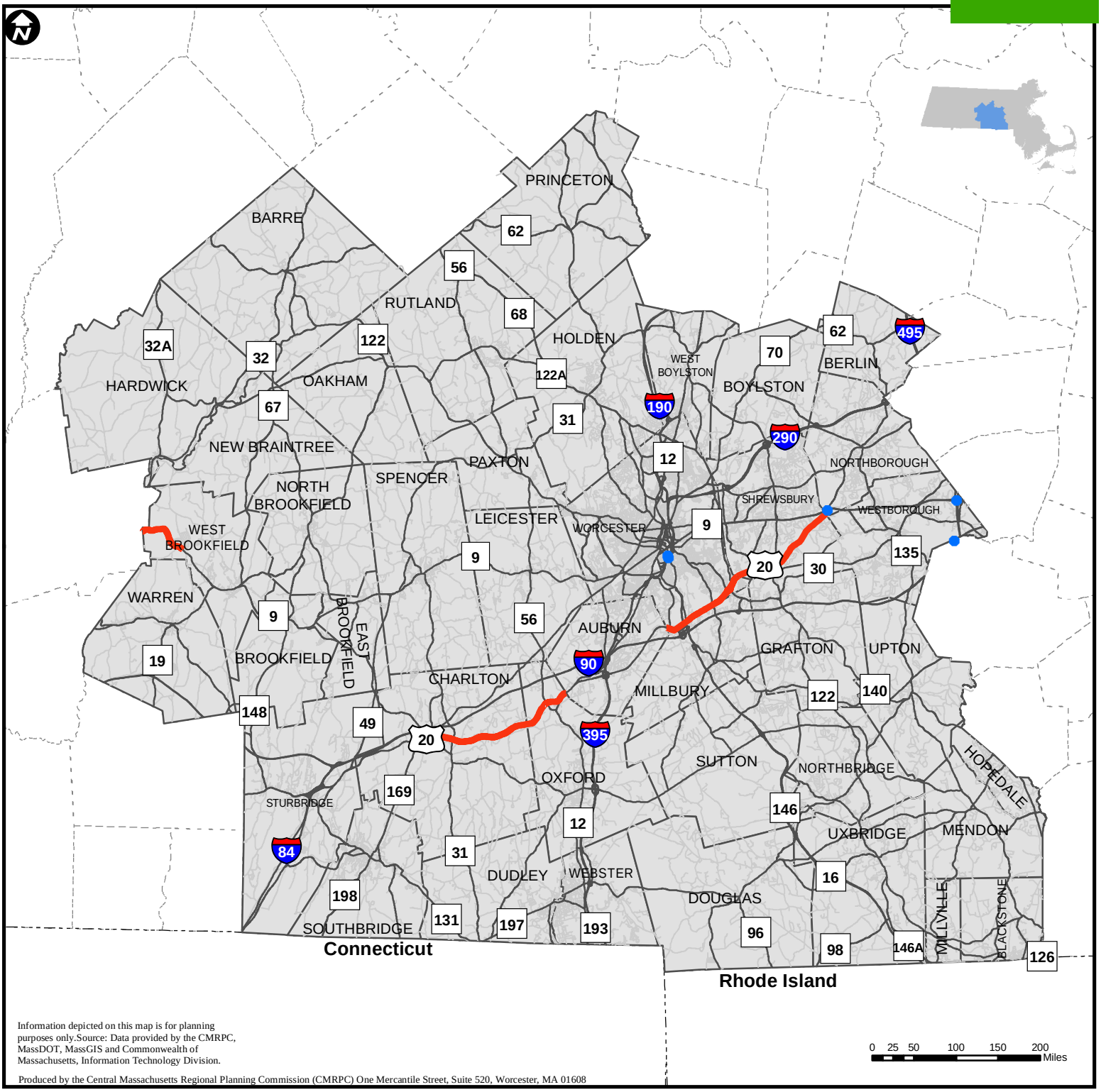
Projected Expenses

Major Infrastructure Projects

The CMMPO deliberated on what major highway-related projects to recommend in *Mobility2040: The Update for 2020*, given the need to remain within the constraints of estimated funding available, and given that revenues are only expected to grow at 2.2% while costs are projected to grow at 4%. This task was made more difficult for projects in the later years of the plan because it was often necessary to estimate costs on projects that are in the early concept stages. The process of estimating costs began with the Stakeholder Consultation interviews conducted as part of the LRTP early public outreach. As the process continued, CMMPO staff discussed the scope and estimated costs of potential major infrastructure projects with MassDOT District #3. This coordination continued to take place throughout the development of the long range transportation plan with input from MassDOT-OTP staff. The following Table VII-2 represents the CMMPO recommendations. Refer to Figure VII-4 for the location of all major infrastructure projects recommended in the plan.

Table VII - 2: Major Infrastructure Projects

Recommended Implementation Schedule	Project Name	Project Scope
2020-2024	Rte 20 Oxford (Rte 20/12 to Richardson's corner)	Rte 20 modernization with median barrier and intersection improvements Charlton/Oxford.
	Route 9 - West Brookfield	2.1 mile segment of rural highway requires widening by 10' to address safety and accommodate bicycles and pedestrians.
2025 - 2029	I-495/Rte. 9 Interchange reconstruction	Make better connections from Rte. 9 interchange to the I-90 interchange.
2030 - 2034	I-290/Vernon St/Kelly Square Bridge Expansion - Worcester	Reconstruction & widening of Vernon Street (Route 122A) bridge over I-290 and related ramp work.
2035 - 2039	Rte. 20 widening Worcester/Shrewsbury	Make the corridor a consistent four lane section throughout the entire corridor in Worcester and Shrewsbury.



Information depicted on this map is for planning purposes only.Source: Data provided by the CMRPC, MassDOT, MassGIS and Commonwealth of Massachusetts, Information Technology Division.

Produced by the Central Massachusetts Regional Planning Commission (CMRPC) One Mercantile Street, Suite 520, Worcester, MA 01608

CMMPO

CENTRAL MASSACHUSETTS Regional Planning Commission

Figure VII-4 Major Infrastructure Projects

- Mobility2040 MI Locations
- Mobility2040 MI Corridors
- CMRPCTowns

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Major Infrastructure Expenditure

The Table VII-3 illustrates the allocation of the Regional discretionary funding for the Major Infrastructure Projects.

Table VII - 3: Major Infrastructure Expenditure

Host Community / Project Name	2020-2024 Costs (endorsed TIP)	Expected Cost 2025-2029	Expected Cost 2030-2034	Expected Cost 2035-2039	Expected Cost 2040
Worcester: Kelley Square Reconstruction [(1)]	$ -				
West Brookfield: MA-9 Reconstruction	$13,389,000				
Oxford / Charlton: US-20 [(2)]	$11,386,727				
Hopkinton/Westborough: (I-495 / I-90 (MassPike) Interchange reconstruction [(3)]	$ -				
Southborough / Westborough: I-495 / MA-9 Interchange reconstruction		$30,000,000			
Worcester: I-290 Exit 13 / MA-122A (Vernon Street) Interchange Bridge Replacement & Ramp Modifications			$36,000,000		
Shrewsbury / Worcester: US-20 Corridor Improvements				$43,200,000	
Total Major Infrastructure Cost	**$24,775,727**	**$30,000,000**	**$36,000,000**	**$43,200,000**	**$ -**
Expected Available Funding from Table VII-1	**$107,832,843**	**$123,631,493**	**$151,803,461**	**$168,251,483**	**$35,786,763**
Available Funding for Programs	**$83,057,116**	**$93,631,493**	**$115,803,461**	**$125,051,483**	**$35,786,763**

Notes:

1) FOR INFORMATION ONLY: Kelley Square Reconstruction Project is using statewide HSIP and STP funding, not affecting regional targets.
2) Total project cost of the project is $73.821 million, only showing target funds programmed for this project.
3) FOR INFORMATION ONLY: Included in Boston Region Financial Plan as per MassDOT CIP.

Programs Expenditure

The Table VII - 4 illustrates the allocation of the regional discretionary funding for the CMMPO program areas based on the funding allocations chosen by the CMMPO (Option 2) and the expected expenditures in major infrastructure projects, which represents a 22.8% of all regional discretionary funds, leaving 77.2% available for program areas.

Table VII – 4: Program Expenditures

Programs	2020-2024 Costs (Endorsed TIP)	Expected Cost 2025-2029	Expected Cost 2030-2034	Expected Cost 2035-2039	Expected Cost 2040	Total	% of Regional Target Funds
Asset Management and System Operations	$53,987,125	$60,860,470	$75,272,249	$81,283,463	$23,261,395	$294,664,702	50.2%
Transit Planning and Mobility Management	$4,152,855	$4,681,574	$5,790,173	$6,252,574	$1,789,338	$22,666,514	3.8%
Livability and Healthy Transportation	$16,611,423	$18,726,298	$23,160,692	$25,010,296	$7,157,352	$90,666,061	15.4%
Climate Change and Resiliency	$8,305,711	$9,363,149	$11,580,346	$12,505,148	$3,578,676	$45,333,030	7.8%
Total Funding for Programs	**$83,057,116**	**93,631,493**	**$115,803,461**	**$125,051,483**	**$35,786,763**	**$453,330,316**	**77.2%**

Transit-Funded Projects & Initiatives

Projected Revenue

Estimates of available federal and state transit revenue were provided by the MassDOT-Office of Transportation Planning and the Rail & Transit Division. Typically, federal funds are used for capital expenses, although some funds are available for preventive maintenance and programs for rural areas, low-income commuters, and services for elders and people with disabilities. Capital funds are provided at 80% levels and operating funds are provided at 50% levels. Massachusetts provides approximately 55% of the net cost of operating regional transit authority services, with the federal government contributing 25% and member communities contributing the remaining 20%. A summary of projected revenue is presented in Table VII-5 below.

Table VII - 5: FFY 2020-2040 Estimated Regional Transportation Plan Transit Funding

	2020-2024	2025-2029	2030-2034	2035-2039	2040	Total
Total Available for Programming	**$183,538,769**	**$194,264,974**	**$205,943,509**	**$218,670,585**	**$88,893,052**	**$891,310,889**
Urbanized Area Formula (5307)*	$48,503,277	$48,046,400	$47,554,213	$47,023,988	$52,869,574	$243,997,452
Enhanced Mobility (5310)*	$2,244,321	$2,488,864	$2,760,050	$3,060,786	$651,069	$11,205,090
State of Good Repair (5337)*	$13,973,128	$15,216,874	$16,571,322	$18,046,332	$3,797,622	$67,605,278
Bus and Bus Facilities (5339)*	$3,639,009	$4,391,346	$5,299,219	$6,394,788	$1,429,590	$21,153,952
RTA Capital Assistance Program**	$5,911,667	$6,368,544	$6,860,731	$7,390,956	$1,545,370	$28,077,268
Local Capital Match (City of Worcester)	$3,493,282	$3,804,218	$4,142,831	$4,511,583	$949,405	$16,901,319
Other Operating Revenue	$18,094,414	$19,492,822	$20,999,306	$22,622,216	$4,730,064	$85,938,822
State Contract Assistance for Operations**	$61,730,974	$66,501,790	$71,641,315	$77,178,043	$16,137,105	$293,189,227
Community Operating Subsidies	$25,948,697	$27,954,116	$30,114,522	$32,441,893	$6,783,253	$123,242,481

**Inflation rates for FTA formula funds are based on total FAST Act (2016-2020) funding levels. FTA 5307 Inflation rate, 2.08%; FTA 5310 Inflation rate, 2.09%; FTA 5337 inflation rate, 1.72%;and FTA 5339 Inflation rate, 3.83%.*

*****Annual funding was increased at a rate of 1.5% to match that of Federal funding programs. These funding amounts will be adjusted on an annual basis, and may differ compared to the numbers presented here.***

Projected Expenses

Initiatives

The major capital rail initiatives anticipated over the planning horizon of *Mobility2040: The Update for 2020* is the continued study of expanding high speed passenger rail between Worcester and Springfield, the *East-West Rail Connection Study*.

Additional initiatives are included in the Transit Planning and Mobility Management Program, and those include possible upgrades to the three MBTA commuter rail stations in Westborough, Grafton, and Worcester, the implementation of Transit Signal Priority to improve the use of transit in congested areas, among other service enhancement initiatives, like a feasibility study for the creation of transit "mini hubs", to house vehicle fleets and serve as connection and transfer facilities. Some of these initiatives are more likely to occur than others, but each will require additional study to move forward, and costs and revenue sources will have to be identified.

Projects

A major transit capital project anticipated over the planning horizon of *Mobility2040: The Update for 2020* is the construction of the Worcester Line Track Improvements, including the Third Track Feasibility Study. The total project cost is estimated at $12,423,539, of which $3,294,614.00 is already programmed on MassDOT 2020-2024 Capital Investment Plan (CIP). Also, the Worcester Union Station improvement project is programmed on the 2020-2024 CIP, with a total estimated cost of $4,384,745.00, and $3,802,011.00 programmed funds. These projects are expected to increase passenger and overall system safety, improve operating schedules, expand capacity options to meet current and future demand, and ADA upgrades. The project is expected to be completed in August 2022.

The major WRTA capital projects are the replacement of the fixed route fleet, maintenance to the existing bus terminal and the purchase of bus shelters. It is expected that 5307 funds will be adequate to fund these projects. Ongoing capital expenditures associated with the existing operations are expected to equate with projected capital funds in later years. See Table VII -6 for transit and commuter rail projects and Table VII-7 for expected expenses associated with transit.

Table VII-6: Transit and Commuter Rail Projects

Project Name & Host Community	Project Scope	Project Cost (in Millions)	Status
INFORMATION ONLY: Worcester Line Track Improvements	Expand capacity; improve safety and operations, and ADA upgrades.	$12.500	Included in 2020-2024 CIP. Total funds programmed: $3,294,614.
INFORMATION ONLY: Worcester Union Station Improvements	Improve Union Station to accommodate current and future demand, reduce maintenance costs and lower energy consumption	$4.400	Included in 2020-2024 CIP. Total funds programmed: $3,802,011.
WRTA Bus Replacement Program; bus terminal maintenance and purchasing bus shelters	Bus replacement, maintenance and new shelters to meet agency's state of good repair.	$17.800	Programed in 2020-2024 CMMPO TIP
East - West Commuter Rail Connection	Expand commuter rail service to western communities through Worcester mainline.	TBD	A Feasibility Study is currently underway.
WRTA Transit Signal Priority Implementation	Increase WRTA efficiency and operations reliability	TBD	Identification of potential corridors is expected to start on FY2020.
WRTA "Mini Hubs" or transfer stations	Improve passenger experience, amenities and convenience	TBD	A study is required to identify locations and determine feasibility.

Table VII -7: Projected Expenses Associated with Transit

Category	2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	Total
Operating Capital	$62,635,847	$68,641,081	$73,945,938	$79,660,776	$16,656,218	$301,539,860
Ongoing Operations and Maintenance	$15,102,660	$9,837,125	$10,597,378	$11,416,385	$2,387,044	$49,340,592
Fleet Replacement – Fixed Route	$18,659,322	$24,090,634	$25,952,455	$27,958,164	$5,845,754	$102,506,329
Fleet Replacement – Demand Response	$685,621	$807,250	$869,638	$936,847	$195,885	$3,495,241
Ongoing Capital Expenses	$2,528,965	$1,366,994	$1,472,641	$1,586,453	$331,710	$7,286,763
M&O Facility GAN	$383,490	$-	$-	$-	$-	$383,490
Infrastructure – Transit Mini-Hub	$2,000,000	$-	$-	$-	$-	$2,000,000
Infrastructure – Transit Signal Priority	$1,000,000	$-	$-	$-	$-	$1,000,000
Union Station State of Good Repair	$7,824,072	$8,428,748	$9,080,155	$9,781,906	$2,045,292	$37,160,173
Total Expenditure	**$110,819,977**	**$113,171,832**	**$121,918,205**	**$131,340,531**	**$27,461,903**	**$504,712,448**
Total Transit Revenue Available for Programming (Table VI-5)	**$183,538,769**	**$194,264,974**	**$205,943,509**	**$218,670,585**	**$88,893,052**	**$891,310,889**
Excess Revenue to be programmed based on availability	**$72,718,792**	**$81,093,142**	**$84,025,304**	**$87,330,054**	**$61,431,149**	**$386,598,441**

Other Funding Sources

The regional discretionary funding is essentially the expected TIP funding for the region over the next 25 years. This category is used to program Major Infrastructure projects for each of the five year bands and the annual TIP program. The CMMPO realizes the need to maintain our current infrastructure and this will be accomplished by some of the TIP projects and, more importantly, by state and local funding that is available to operate and maintain much of the road network in the region. It is also used to advance the implementation of the CMMPO programs.

Besides the regional discretionary funds, programs rely on funds administered through the Unified Planning Work Program to complete technical assistance to the region's communities, complete studies or corridor profiles and continue with the activities related to transportation planning. As aforementioned, not all needs result in a major infrastructure project or a TIP project.

The Commonwealth administers the Chapter 90 Program. It is a reimbursement program, in which the municipalities receive 100% of the funds, used for capital improvements, such as highway construction, preservation and improvement projects to towns. The amount of funds is prescribed by a formula that takes into consideration the amount of miles, population and employment in the Commonwealth's municipalities. In 2019, Chapter 90 funds total apportionment was $200 million. Of these, $19,219,200 was available to the CMMPO communities. See Table VII – 8. The City of Worcester accounted for almost 21% of the total funds available in the region, or $4,094,224. The lowest apportionment in the CMMPO region goes to the Town of East Brookfield, $95,368 in 2019. It is also assumed that Chapter 90 funds will not increase in the next five (5) years.

Another funding source is MassDOT Complete Streets Funding Program. This program provides technical assistance and construction to eligible municipalities. The maximum amount granted to municipalities is $50,000 for technical assistance and $400,000 for construction.

In order to be granted the award, the communities need to follow a series of steps to be eligible to access the funds. The process is divided in tiers, allowing each municipality to work at their own pace. Tier 1 requires completion of a Complete Streets training and the development of a Complete Streets policy. Tier 2 refers to the completion of a Complete Streets Prioritization Plan. At Tier 3, the municipalities submit a project for approval and receive the notice to proceed.

Table VII – 8: Chapter 90 Apportionment by Municipality

Chapter 90 CMMPO Region (2019)					
City/Town	Highway District	Miles 2017	Population 2010	Employment 2017	Amount
AUBURN	3	96.25	16,188	10,662	$609,252
BARRE	2	97.30	5,398	1,155	$430,535
BERLIN	3	42.21	2,866	563	$190,833
BLACKSTONE	3	41.07	9,026	1,318	$234,650
BOYLSTON	3	39.92	4,355	1,565	$203,354
BROOKFIELD	3	36.14	3,390	349	$167,780
CHARLTON	3	126.16	12,981	3,926	$625,473
DOUGLAS	3	76.18	8,471	1,018	$365,459
DUDLEY	3	82.28	11,390	3,057	$432,505
EAST BROOKFIELD	3	19.29	2,183	472	$95,368
GRAFTON	3	84.99	17,765	4,490	$500,906
HARDWICK	2	85.32	2,990	527	$360,600
HOLDEN	3	116.81	17,346	3,863	$615,739
HOPEDALE	3	28.26	5,911	1,849	$170,845
LEICESTER	3	84.03	10,970	2,258	$427,080
MENDON	3	55.05	5,839	1,631	$273,044
MILLBURY	3	70.84	13,261	5,208	$425,298
MILLVILLE	3	22.13	3,190	274	$110,542
NEW BRAINTREE	2	49.64	999	225	$204,096
NORTH BROOKFIELD	3	68.98	4,680	849	$310,999
NORTHBOROUGH	3	79.77	14,155	9,677	$519,731
NORTHBRIDGE	3	77.88	15,707	5,383	$470,590
OAKHAM	3	42.65	1,902	188	$181,937
OXFORD	3	90.42	13,709	5,740	$511,440
PAXTON	3	38.76	4,806	861	$193,216
PRINCETON	3	78.72	3,413	807	$340,695
RUTLAND	3	78.99	7,973	1,376	$377,643
SHREWSBURY	3	149.71	35,608	14,282	$986,356
SOUTHBRIDGE	3	77.86	16,719	6,408	$489,278
SPENCER	3	99.05	11,688	3,189	$501,864
STURBRIDGE	3	79.16	9,268	5,131	$431,646
SUTTON	3	94.64	8,963	2,865	$463,300
UPTON	3	63.62	7,542	1,304	$313,614
UXBRIDGE	3	97.71	13,457	3,417	$510,601
WARREN	2	63.05	5,135	641	$288,107
WEBSTER	3	72.47	16,767	7,141	$477,223
WEST BOYLSTON	3	49.82	7,669	3,815	$290,386
WEST BROOKFIELD	2	50.46	3,701	961	$233,357
WESTBOROUGH	3	94.92	18,272	25,011	$789,634
WORCESTER	3	432.91	181,045	103,342	$4,094,224
CMMPO REGION		**3235.42**	**556,698**	**246,798**	**$19,219,200**

As of May 2019, Figure VII-5 shows only 14 of 40 CMMPO communities have yet to participate in the Complete Streets Program, 4 are in Tier 1, 5 in Tier 2 and 17 in Tier 3. In FY2018, only four (4) communities within the CMMPO region received the grant: Mendon, West Boylston, Spencer and Millville, for a total of $1,008,283 granted funds. See Table VII – 9 for more details. CMMPO staff offers technical assistance to the region's communities in topics related to Complete Streets, policy development and prioritization plans. It is expected that more communities within the CMMPO region will be granted this award in the future. In addition to this, given that the Complete Streets Program has a cap of $400,000 for construction, staff is encouraging municipalities to consider the Transportation Alternatives Program (TAP) that is programmed through the TIP or a combination of funds for projects that exceeds the limits of the Complete Streets Program award.

Figure VII – 5: CMMPO Communities Participation in the Complete Streets Program

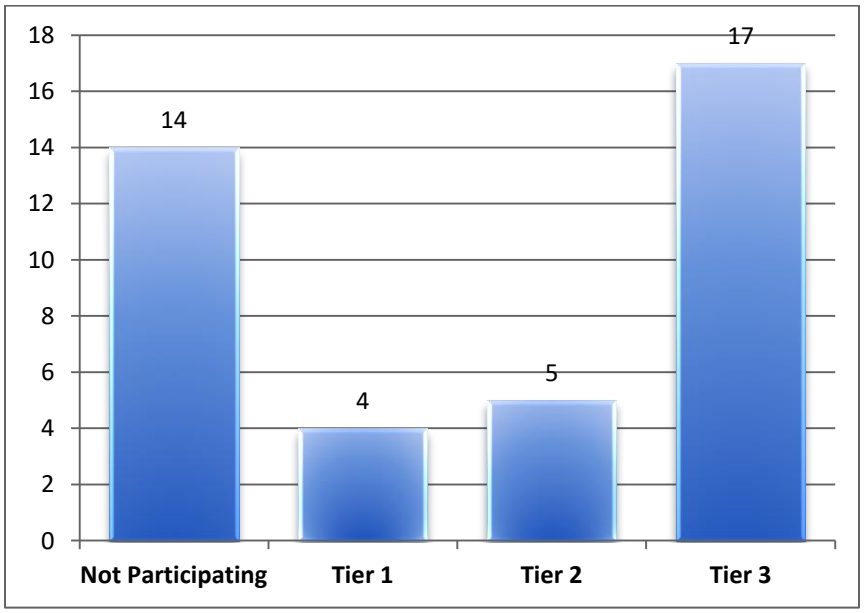


Table VII – 9: FY2018 Complete Streets Approved Projects in the CMMPO Region

Towns	Amount Awarded	Project cost	Other funding sources*	Project Description
Mendon	$ 399,118.00	$ 400,000.00	$ 882.00	Sidewalk replacement and ADA pedestrian safety improvements at Main Street and Maple Street
Millville	$ 200,000.00	$ 425,000.00	$ 225,000.00	Central Street sidewalk from Providence Street to RI border.
Spencer	$ 218,791.00	$ 318,791.00	$ 100,000.00	Main Street West Phase I
West Boylston	$ 190,374.00	$ 190,374.00	$ -	Crescent Street Sidewalks
CMMPO REGION	$ 1,008,283.00	$ 1,334,165.00	$ 325,882.00	

Source: Retrieved from: https://masscompletestreets.com/Map/

Note: * Other funding sources for the projects listed herein are from Chapter 90 Program.

A new transportation fund available to the CMMPO communities is the Municipal Rideshare Fund. By law, the Massachusetts Transportation Network Company (TNC) Division within the Department of Public Utilities must collect $0.20 per-ride assessment on all TNC rides originating in the Commonwealth. Half of the amount collected is distributed to cities and towns based on the amount of rides started in each community. In 2017 the assessment from TNC was $12.8 million from 64.8 million rideshare trips. Most of the CMMPO communities banked the funds for future use or for road maintenance, among other related DPW activities (signage, patching potholes, sidewalk improvements, etc.). As shown in Table VII-10, Grafton received $1,228.10 and reported they will use the funds in the construction of a new sidewalk on Millbury Street from Fitzpatrick Road to Millbury Street Elementary School (approximately 0.5 miles). The Town of Millbury reported using the $2,016.40 for their Council on Aging Rides Program. The Town of Shrewsbury received $6,416.60 and town officials are evaluating multiple projects to improve pedestrian safety. The City of Worcester received the highest amount in the region, $84,890.30, and reported that the funds will be used to install and improve pedestrian traffic signals.

Table VII-10: Top 10 Communities in the Region by Rideshare Trips (2017)

Community	Origin Trips		Total	Proportion
Worcester	**848,943**	$	84,894.30	76.8%
Shrewsbury	64,166	$	6,416.60	5.8%
Westborough	52,774	$	5,277.40	4.8%
Auburn	25,034	$	2,503.40	2.3%
Millbury	20,164	$	2,016.40	1.8%
Northborough	19,988	$	1,998.80	1.8%
Grafton	12,281	$	1,228.10	1.1%
Holden	8,938	$	893.80	0.8%
West Boylston	6,135	$	613.50	0.6%
Leicester	5,995	$	599.50	0.5%
Other 30 communities	41,548	$	4,154.80	3.8%
Total	**1,105,966**	**$**	**110,596.60**	**100.0%**

Source: https://www.mass.gov/info-details/2017-municipal-rideshare-fund-report#map-of-funding-levels-

Another statewide funding source is the MassWorks Infrastructure Program. This is a competitive grant program that provides capital funds to municipalities for public infrastructure projects, and helps accelerate housing production and spur economic development. Through the years, the region has seen these funds invested in road reconstruction, streetscape improvements, road widening, sewer improvements, utility extensions and road safety improvements. For the 2018 round of awards, the projects submitted by communities in the CMMPO region totaled $43.7 million dollars. See list below for details.

MassWorks Grants in the CMMPO Region (2016 to 2018)

2016

- **Millville: Central Street Transportation Improvement Project**
  - Amount Awarded: $1,000,000.00
  - Project description: Millville's rural road safety project will reconstruct a major collector road in the Town's center, reducing flooding hazards, complementing a recent intersection reconstruction, and utilizing a Complete Streets design approach that will increase connectivity to the town center for pedestrians, bicyclists, and motorists.
- **West Brookfield: Cottage and Lake Streets Reconstruction Project**
  - Amount Awarded: $1,000,000.00
  - Project Description: West Brookfield will make streetscape improvements to three roadways -- Cottage Street, Lakeview Avenue and Lake Street -- that connect West Brookfield Center and the Town Beach. Improvements will

increase pedestrian safety and accessibility by implementing traffic calming measures, constructing new sidewalks, and improving intersections. West Brookfield is providing $114,000 in matching funds.

- **Worcester: Main Street Improvement Project**
  - Amount Awarded: $2,300,000.00
  - Project Description: Worcester's MassWorks grant will advance the City's ongoing efforts to create a walkable urban area along the Main Street Central Business District, by making streetscape improvements that encourage private investment in the City's downtown. MassWorks funds will leverage $7.5 million in federal, state and local funding already invested to create a vibrant, pedestrian-friendly Main Street district. Streetscape improvements in Worcester's Transformative Development district are consistent with the goals of the City's Downtown Urban Revitalization Plan, and will advance the redevelopment of the nearby City Square development.
- **Worcester: Stearns Tavern Improvement Project**
  - Amount Awarded: $100,000.00
  - Project Description: MassWorks funds will support the relocation of the 204-year-old Stearns Tavern, one of the oldest structures in the city of Worcester, from Webster Square, to a City-owned vacant lot that was once home to the Coes Knife factory. The project will enable the Seven Hills Foundation to occupy the first floor of the repurposed tavern, while operating a café and other workforce training programs for individuals with disabilities.

2017

- **Charlton: East Charlton Route 20 Water Extension**
  - Amount Awarded: $2,652,296.00
  - Project Description: In Charlton, the installation of a new water main and activation of an existing, dry water main on Route 20 will directly benefit 131 acres, across 39 parcels in Charlton and Oxford to new commercial development, and benefit development of an additional 96 acres along the currently dry water main in Charlton. The project will also complement the $57 million MassDOT safety improvement project that will rebuild a 3-mile stretch of Route 20 from Charlton to Oxford.
- **Oakham: Reconstruction & Resurfacing of Ware Corner Rd, Adams Rd, South Rd**
  - Amount Awarded: $1,000,000.00

  - Project Description: Oakham will use funds for the reconstruction of Ware Corner Road and South Road, replacing failing culverts, and pursuing a full-depth reclamation and repaving projects. This project will improve road safety and transportation for residents, small businesses and emergency vehicles in the town.

- **Southbridge: Main & Laurel Streets Drainage Relocation**
  - Amount Awarded: $419,594.00
  - Project Description: The Main & Laurel Streets Drainage Relocation Project in Southbridge will relocate a public stormwater drain, allowing for the construction of United Lens Corporation's new utility building. The project will leverage $2,600 in town contributions towards design, and support a $15 million reinvestment by United Lens Corporation in their current location, which employs 150 individuals. A centralized, 3,780 square foot utility building will enhance safety, increase efficiency, and support the retention of current jobs and creation of future jobs.
- **Warren: Quaboag Street Improvements**
  - Amount Awarded: $1,000,000.00
  - Project Description: Warren will make roadway, drainage and sidewalk improvements on Quaboag Street, a designated Environmental Justice area, to enhance safety for motorists and pedestrians in the densely developed neighborhood. The MassWorks award will complement a Community Development Block Grant (CDBG) award and $20,000 in Chapter 90 local infrastructure aid.
- **Worcester: Worcester Senior Center Parking and Renovation Project**
  - Amount Awarded: $1,500,000.00
  - Project Description: The award will support the long-term redevelopment of the Nurses' Wing at the Worcester Senior Center and improve traffic circulation. Funding will enable redevelopment of the Nurse's Wing at the Worcester Senior Center into 60 units of future senior-housing. The project will prepare the site for development by demolishing and remediating existing structures to create more parking, enhance the site's circulation, and improve nearby traffic flow.

2018

- **Grafton: Sewer improvements on Westboro Road**
  - Amount Awarded: $575,000.00

  - Project Description: Sewer improvements on Westboro Road to expand septic capacity for additional commercial and residential development along Route 30.
- **Shrewsbury: Route 20 widening and improvements**
  - Amount Awarded: $3,750,000.00
  - Project Description: Reconstruction and 4-lane expansion and signalization of Route 20 and Lake Street to facilitate planned redevelopment of Edgemere Drive-in Theater property as a mixed-use development.
- **Sutton: Installation of Natural Gas line**
  - Amount Awarded: $2,250,000.00
  - Project Description: Funding for 13,200 feet of natural gas line to facilitate the construction of a Primetals Technologies USA facility in the South Sutton Commerce Park.
- **Worcester: Canal District Streetscape improvements**
  - Amount Awarded: $400,000.00
  - Project Description: Funding for pedestrian and streetscape infrastructure to enhance safety and add aesthetic improvements, allowing access to neighborhoods and commercial areas in the Canal District adjacent to the Public Market at Harding - Green development.
- **Worcester: Canal District Parking Garage**
  - Amount Awarded: $32,500,000.00
  - Project Description: Funds to build a new Canal District parking garage and improve the area's infrastructure to support the new $90-million Polar Park stadium for the Pawtucket Red Sox and surrounding developments.
- **Uxbridge: Utility extension to Douglas Street and new business park**
  - Amount Awarded: $1,700,000.00
  - Project Description: The award will be used to add 2,700 linear feet of utilities from Taft Hill Lane to the new business park at the Route 146 and route 16 interchange.
- **Oxford: Route 12 safety improvements**
  - Amount Awarded: $2,500,000.00
  - Project Description: Funds will enable traffic safety and efficiency improvements along Route 12, including traffic signals and the reconstruction of the intersection to 3-lanes. The upgrades will enable the planned expansion of the IPG Photonics Corporation.

Another statewide funding source available to the CMMPO communities is the Housing Choice Initiative. This statewide program rewards municipalities that have produced certain rates of housing units in a five-year period. The funds are used for infrastructure improvements that allow the sustainable development of the municipality. In 2018 the towns of Boylston and Mendon received Housing Choice awards.

- **Boylston: Traffic engineering study for the Route 140/Sewall Street intersection**
  - Amount Awarded: $83,500
  - Project Description: This award will fund a traffic engineering study for the Route 140 and Sewall Street intersection. This project will consider reconfiguring the layout for better traffic flows associated with the proposed development of 66 units of apartments affecting the North Sewall Street intersection, a recently approved 30-unit Senior Residential Development on South Sewall Street and a 57 lot subdivision that is nearing completion.
- **Mendon: Site readiness study and public water supply analysis**
  - Amount Awarded: $26,500
  - Project Description: The grant will fund a site readiness study and public water supply analysis on a town-owned parcel with 3 acres of developable land, which might support 40 to 50 units of new housing. The town purchased the parcel with Community Preservation Act (CPA) funds with the intention of seeking developers for an affordable housing development. The analysis should increase the project's likelihood of success and make it more attractive to potential developers.

In an effort to reduce emissions, promote clean energy solutions and reduce costs the Commonwealth of Massachusetts through the Department of Energy Resources administers the Green Communities Grant Program. In accordance to the Green Communities Act, every year the program has up to $20 million available for eligible communities to either implement energy efficiency measures, construct renewable energy projects or to reduce their energy consumption and fossil-fuel dependence. Since 2010, the CMMPO's communities have been awarded more than $8.8 million through this grant program. Besides retrofits and improving efficiencies in publicly-owned properties, the funds have been used for the construction of charging stations for electric vehicles and for the purchase of either electric vehicles or hybrid vehicles. As of May 2019, 30 out of the 40 CMMPO communities have the Green Community designation, hence eligible to apply for funds.

The Massachusetts Downtown initiative is another statewide program that grants funds to improve the livability of downtown areas. As an example, the towns of Auburn and Shrewsbury, each received $15,000 in FY2019 for wayfinding and branding strategies of their downtown areas, whereas the Town of Spencer, also received $15,000 for the analysis of current and future downtown parking demand.

Also, the CMMPO works in collaboration with the Central Mass Regional Planning Commission (CMRPC). CMRPC provides the platform to work with host communities on multiple projects, granting access to multiple funding sources. One of these funding sources is the District Local Technical Assistance (DLTA) fund. DLTA funds are distributed among the 13 regional planning agencies to provide technical assistance to the cities and towns. In the past year, this fund was used to develop a parking study in the Town of Westborough.

In addition to this, CMRPC staff assists the region's communities in their grant applications for the Community Development Block Grants, also known as the CDBG funds from the U.S. Department of Housing and Urban Development (HUD). These are commonly used to fund local community infrastructure projects, among other types of projects, community activities and other social interventions. In the past, the region's communities had used these funds for road reconstruction projects or for improvements to the street infrastructure, construction of parking facilities, and ADA accommodations.

Other federal agencies, like the U.S. Environmental Protection Agency (EPA) have grant programs that had benefited the CMMPO region's communities in the past, specifically the Brownfields grants: assessments grants, cleanup grants, or revolving loan fund grant. Also, through the Clean Water Act implementation grants, some communities had the opportunity to build projects with the Integrated Water Quality Improvement Grant, like the project for the Blackstone Valley River in Grafton.

In summary, the CMMPO recognizes that the region's communities are exposed to a wide array of funding sources that can be accessed to address the region's needs and priorities beyond the regional discretionary funds. Some of the funds can be combined, used in preparation of a major infrastructure project or to support studies and planning activities. It is assumed that these grant programs, whether statewide or national, will continue to be available in the future. See Table VII – 11 for more details.

Table VII – 11: Other Funding Sources

	Base Year	2020-2024	2025-2029	2030-2034	2035-2039	2040
Chapter 90[1]	$19,000,000	$95,000,000	$96,425,000	$97,871,375	$99,339,446	$24,834,861
Complete Streets[2]	$1,600,000	$8,000,000	$8,000,000	$8,000,000	$8,000,000	$400,000
MassWorks[3]	$5,000,000	$25,000,000	$25,375,000	$25,755,625	$26,141,959	$6,535,490
CDBG[4]	$8,000,000	$40,000,000	$40,600,000	$41,209,000	$41,827,135	$10,456,784
Housing Choice / EEA[5]	$100,000	$500,000	$507,500	$515,113	$522,839	$130,710
TNC Transportation Fund	$100,000	$500,000	$507,500	$515,113	$522,839	$130,710
	$33,800,000	$169,000,000	$171,415,000	$173,866,225	$176,354,218	$42,488,555

1. It is assumed Chapter 90 funds will not increase in the next 5 years. A 1.5% increase was added every 5 years starting in 2025.
2. It is assumed at least 4 projects per year at a maximum of $400,000.
3. Projects in the region's communities range from $1M to $3M.
4. Given CMRPC work in this area, more communities are expected to be funded through this program.
5. Communities are using these funds to fund traffic studies / parking studies

Financial Constraint

The financial analysis provided above for both Highway and Transit has addressed the revenue sources reasonably expected to be available, from both federal and state sources. It also includes the costs associated with major infrastructure projects and programs, including the operations and maintenance needs of the existing transportation system, along with a limited number of projects intended to improve the multi-modal system selected by the CMMPO, following extensive public input. Table VII-12 shows the expected expenditures through the 2040 horizon for highway and Table VII-13 shows expenditures for transit.

Table VII – 12: Financial Constraint (Highway)

Description	2020-2024 Costs (endorsed TIP)	Expected Cost 2025-2029	Expected Cost 2030-2034	Expected Cost 2035-2039	Expected Cost 2040
Total Major Infrastructure Cost from Table VII-3	**$24,775,727**	**$30,000,000**	**$36,000,000**	**$43,200,000**	**$ -**
Total Funding for Programs from Table VII-4	**$83,057,116**	**93,631,493**	**$115,803,461**	**$125,051,483**	**$35,786,763**
Total Expenditure Major Infrastructure + Programs	**$107,832,843**	**123,631,493**	**151,803,461**	**168,251,483**	**$35,786,763**
Expected Available Funding from Table VI-1	**$107,832,843**	**123,631,493**	**151,803,461**	**168,251,483**	**$35,786,763**

Table VII – 13: Financial Constraint (Transit)

Category	2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	Total
Total Expenditure	**$110,819,977**	**$113,171,832**	**$121,918,205**	**$131,340,531**	**$27,461,903**	**$504,712,448**
Total Transit Revenue Available for Programming (Table VI-5)	**$183,538,769**	**$194,264,974**	**$205,943,509**	**$218,670,585**	**$88,893,052**	**$891,310,889**
Excess Revenue to be programmed based on availability	**$72,718,792**	**$81,093,142**	**$84,025,304**	**$87,330,054**	**$61,431,149**	**$386,598,441**

Based on the above considerations, the *Mobility2040: The Update for 2020*, the 2020 long range transportation plan for the CMMPO region, has been determined to meet federal planning and financial constraint requirements.

CHAPTER VIII

Air Quality and Greenhouse Gas Assessment

This section documents the latest air quality conformity determination for the 1997 ozone National Ambient Air Quality Standards (NAAQS) in the CMMPO Region. It covers the applicable conformity requirements according to the latest regulations, regional designation status, legal considerations, and federal guidance. Further details and background information are provided below:

Air Quality Conformity

Introduction

The 1990 Clean Air Act Amendments (CAAA) require metropolitan planning organizations within nonattainment and maintenance areas to perform air quality conformity determinations prior to the approval of Long-Range Transportation Plans (LRTPs) and Transportation Improvement Programs (TIPs), and at such other times as required by regulation. Clean Air Act (CAA) section 176(c) (42 U.S.C. 7506(c)) requires that federally funded or approved highway and transit activities are consistent with ("conform to") the purpose of the State Implementation Plan (SIP). Conformity to the purpose of the SIP means that means Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) funding and approvals are given to highway and transit activities that will not cause or contribute to new air quality violations, worsen existing violations, or delay timely attainment of the relevant NAAQS or any interim milestones (42 U.S.C. 7506(c)(1)). EPA's transportation conformity rules establish the criteria and procedures for determining whether metropolitan transportation plans, transportation improvement programs (TIPs), and federally supported highway and transit projects conform to the SIP (40 CFR Parts 51.390 and 93).

A nonattainment area is one that the U.S. Environmental Protection Agency (EPA) has designated as not meeting certain air quality standards. A maintenance area is a nonattainment area that now meets the standards and has been re-designated as maintaining the standard. A conformity determination is a demonstration that plans, programs, and projects are consistent with the State Implementation Plan (SIP) for attaining the air quality standards. The CAAA requirement to perform a conformity determination ensures that federal approval and funding go to transportation activities that are consistent with air quality goals.

Legislative and Regulatory Background

The entire Commonwealth of Massachusetts was previously classified as nonattainment for ozone, and was divided into two nonattainment areas. The Eastern Massachusetts ozone nonattainment area included Barnstable, Bristol, Dukes, Essex, Middlesex, Nantucket, Norfolk,

Plymouth, Suffolk, and Worcester counties. Berkshire, Franklin, Hampden, and Hampshire counties comprised the Western Massachusetts ozone nonattainment area. With these classifications, the 1990 Clean Air Act Amendments (CAAA) required the Commonwealth to reduce its emissions of volatile organic compounds (VOCs) and nitrogen oxides (NOx), the two major precursors to ozone formation to achieve attainment of the ozone standard.

The 1970 Clean Air Act defined a one-hour national ambient air quality standard (NAAQS) for ground-level ozone. The 1990 CAAA further classified degrees of nonattainment of the one-hour standard based on the severity of the monitored levels of the pollutant. The entire commonwealth of Massachusetts was classified as being in serious nonattainment for the one-hour ozone standard, with a required attainment date of 1999.The attainment date was later extended, first to 2003 and a second time to 2007.

In 1997, the EPA proposed a new, eight-hour ozone standard that replaced the one- hour standard, effective June 15, 2005. Scientific information had shown that ozone could affect human health at lower levels, and over longer exposure times than one hour. The new standard was challenged in court, and after a lengthy legal battle, the courts upheld it. It was finalized in June 2004.The eight-hour standard is 0.08 parts per million, averaged over eight hours and not to be exceeded more than once per year. Nonattainment areas were again further classified based on the severity of the eight-hour values. Massachusetts as a whole was classified as being in moderate nonattainment for the eight-hour standard, and was separated into two nonattainment areas—Eastern Massachusetts and Western Massachusetts.

In March 2008, EPA published revisions to the eight-hour ozone NAAQS establishing a level of 0.075 ppm, (March 27, 2008; 73 FR 16483). In 2009, EPA announced it would reconsider this standard because it fell outside of the range recommended by the Clean Air Scientific Advisory Committee. However, EPA did not take final action on the reconsideration so the standard would remain at 0.075 ppm.

After reviewing data from Massachusetts monitoring stations, EPA sent a letter on December 16, 2011 proposing that only Dukes County would be designated as nonattainment for the new proposed 0.075 ozone standard. Massachusetts concurred with these findings.

On May 21, 2012, (77 FR 30088), the final rule was published in the Federal Register, defining the 2008 NAAQS at 0.075 ppm, the standard that was promulgated in March 2008. A second rule published on May 21, 2012 (77 FR 30160), revoked the 1997 ozone NAAQS to occur one year after the July 20, 2012 effective date of the 2008 NAAQS.

Also on May 21, 2012, the air quality designations areas for the 2008 NAAQS were published in the Federal Register. In this Federal Register, the only area in Massachusetts that was designated as nonattainment is Dukes County. All other Massachusetts counties were designated as attainment/unclassified for the 2008 standard. On March 6, 2015, (80 FR 12264, effective April 6, 2015) EPA published the Final Rulemaking, "Implementation of the 2008 National Ambient Air Quality Standards (NAAQS) for Ozone: State Implementation Plan Requirements; Final Rule." This rulemaking confirmed the removal of transportation conformity to the 1997 Ozone NAAQS.

However, on February 16, 2018, the United States Court of Appeals for the District of Columbia Circuit in *South Coast Air Quality Mgmt. District v. EPA* ("*South Coast II*," 882 F.3d 1138) held that transportation conformity determinations must be made in areas that were either nonattainment or maintenance for the 1997 ozone NAAQS and attainment for the 2008 ozone NAAQS when the 1997 ozone NAAQS was revoked. These conformity determinations are required in these areas after February 16, 2019. On November 29, 2018, EPA issued *Transportation Conformity Guidance for the South Coast II Court Decision* (EPA-420-B-18-050, November 2018) that addresses how transportation conformity determinations can be made in areas. According to the guidance, both Eastern and Western Massachusetts, along with several other areas across the country, are now defined as "orphan nonattainment areas" – areas that were designated as nonattainment for the 1997 ozone NAAQS at the time of its revocation (80 FR 12264, March 6, 2015) and were designated attainment for the 2008 ozone NAAQS in EPA's original designations rule for this NAAQS (77 FR 30160, May 21, 2012).

Current Conformity Determination

After 2/16/19, as a result of the court ruling and the subsequent federal guidance, transportation conformity for the 1997 NAAQS – intended as an "anti-backsliding" measure – now applies to both of Massachusetts' orphan areas. Therefore, this conformity determination is being made for the 1997 ozone NAAQS on the CMMPO FFY 2020-2024 Transportation Improvement Program and 2020-2040 Regional Transportation Plan.

The transportation conformity regulation at 40 CFR 93.109 sets forth the criteria and procedures for determining conformity. The conformity criteria for TIPs and RTPs include: latest planning assumptions (93.110), latest emissions model (93.111), consultation (93.112), transportation control measures (93.113(b) and (c), and emissions budget and/or interim emissions (93.118 and/or 93.119).

For the 1997 ozone NAAQS areas, transportation conformity for TIPs and RTPs for the 1997 ozone NAAQS can be demonstrated without a regional emissions analysis, per 40 CFR 93.109(c). This provision states that the regional emissions analysis requirement applies one year after the effective date of EPA's nonattainment designation for a NAAQS and until the effective date of revocation of such NAAQS for an area. The 1997 ozone NAAQS revocation was effective on April 6, 2015, and the *South Coast II* court upheld the revocation. As no regional emission analysis is required for this conformity determination, there is no requirement to use the latest emissions model, or budget or interim emissions tests.

Therefore, transportation conformity for the 1997 ozone NAAQS for the CMMPO FFY 2020-2024 Transportation Improvement Program and 2020-2040 Regional Transportation Plan can be demonstrated by showing that remaining requirements in Table 1 in 40 CFR 93.109 have been met. These requirements, which are laid out in Section 2.4 of EPA's guidance and addressed below, include:

- Latest planning assumptions (93.110)
- Consultation (93.112)
- Transportation Control Measures (93.113)
- Fiscal Constraint (93.108)

Latest Planning Assumptions:

The use of latest planning assumptions in 40 CFR 93.110 of the conformity rule generally apply to regional emissions analysis. In the 1997 ozone NAAQS areas, the use of latest planning assumptions requirement applies to assumptions about transportation control measures (TCMs) in an approved SIP (See following section on Timely Implementation of TCMs).

Consultation:

The consultation requirements in 40 CFR 93.112 were addressed both for interagency consultation and public consultation. Interagency consultation was conducted with FHWA, FTA, US EPA Region 1, MassDEP, and the other Massachusetts MPOs, with the most recent conformity consultation meeting held on March 6, 2019 (this most recent meeting focused on understanding the latest conformity-related court rulings and resulting federal guidance). This ongoing consultation is conducted in accordance with the following:

- Massachusetts' Air Pollution Control Regulations 310 CMR 60.03 "Conformity to the State Implementation Plan of Transportation Plans, Programs, and Projects Developed, Funded or Approved Under Title 23 USC or the Federal Transit Act"

- The Commonwealth of Massachusetts Memorandum of Understanding by and between Massachusetts Department of Environmental Protection, Massachusetts Executive Office of Transportation and Construction, Massachusetts Metropolitan Planning Organizations concerning the conduct of transportation-air quality planning in the development and implementation of the state implementation plan" (note: this MOU is currently being updated)

Public consultation was conducted consistent with planning rule requirements in 23 CFR 450. Title 23 CFR Section 450.324 and 310 CMR 60.03(6)(h) requires that the development of the TIP, RTP, and related certification documents provide an adequate opportunity for public review and comment. Section 450.316(b) also establishes the outline for MPO public participation programs. The CMMPO's Public Outreach Program (POP) was formally adopted in 2017. The Public Outreach Program ensures that the public will have access to the RTP and all supporting documentation, provides for public notification of the availability of the RTP and the public's right to review the document and comment thereon, and provides a 21-day public review and comment period prior to the adoption of the RTP and related certification documents.

The public comment period for this conformity determination commenced on June 20, 2019. During the 21-day public comment period, any comments received were incorporated into this Plan. This allowed ample opportunity for public comment and CMMPO review of the draft document. The public comment period will close on July 10, 2019 and subsequently, the CMMPO is expected to endorse this air quality conformity determination on July 17, 2019. These procedures comply with the associated federal requirements.

Timely Implementation of Transportation Control Measures:

Transportation Control Measures (TCMs) have been required in the SIP in revisions submitted to EPA in 1979 and 1982. All SIP TCMs have been accomplished through construction or through implementation of ongoing programs. All of the projects have been included in the Region's Transportation Plan (present of past) as recommended projects or projects requiring further study.

DEP submitted to EPA its strategy of programs to show Reasonable Further Progress of a 15% reduction of VOCs in 1996 and the further 9% reduction of NOx toward attainment of the National Ambient Air Quality Standards (NAAQS) for ozone in 1999. Within that strategy there are no specific TCM projects. The strategy does call for traffic flow improvements to reduce

congestion and, therefore, improve air quality. Other transportation-related projects that have been included in the SIP control strategy are listed below:

- *Enhanced Inspection and Maintenance Program*
- *California Low Emission Vehicle Program*
- *Reformulated Gasoline for On- and Off-Road Vehicles*
- *Stage II Vapor Recovery at Gasoline Refueling Stations*
- *Tier I Federal Vehicle Standards*

Fiscal Constraint:

Transportation conformity requirements in 40 CFR 93.108 state that TIPs and transportation plans and must be fiscally constrained consistent with DOT's metropolitan planning regulations at 23 CFR part 450. The CMMPO 2020-2024 Transportation Improvement Program and 2020-2040 Regional Transportation Plan are fiscally constrained, as demonstrated in Section 1 of Part B of the TIP and Chapter 7 of the RTP.

As of April 22, 2002, the city of Worcester was re-designated as being in attainment for carbon monoxide (CO) with an EPA-approved limited maintenance plan. In areas with approved limited maintenance plans, federal actions requiring conformity determinations under the transportation conformity rule are considered to satisfy the "budget test" (as budgets are treated as not constraining in these areas for the length of the initial maintenance period). Any future required "project level" conformity determinations for projects located within this community will continue to use a "hot-spot" analysis to assure that any new transportation projects in this CO attainment area do not cause or contribute to carbon monoxide non-attainment.

In summary and based upon the entire process described above, the CMMPO has prepared this conformity determination for the 1997 Ozone NAAQS in accordance with EPA's and Massachusetts' latest conformity regulations and guidance. This conformity determination process demonstrates that the FFY 2020-2024 Transportation Improvement Program and the 2020-2040 Regional Transportation Plan meet the Clean Air Act and Transportation Conformity Rule requirements for the 1997 Ozone NAAQS, and have been prepared following all the guidelines and requirements of these rules during this time period.

Therefore, the implementation of the CMMPO's FFY 2020-2024 Transportation Improvement Program and the 2020-2040 Regional Transportation Plan are consistent with the air quality goals of, and in conformity with, the Massachusetts State Implementation Plan.

Evaluation and Reporting of Statewide Greenhouse Gas Reductions in Transportation, July 2019

This section documents recent progress made by MassDOT and the MPOs in working to help achieve greenhouse gas (GHG) reduction goals as outlined in state regulations applicable to Massachusetts. This "progress report" estimates future carbon dioxide (CO_2) emissions from the transportation sector as part of meeting the GHG reduction goals established through the Commonwealth's Global Warming Solutions Act (GWSA).

GWSA Transportation Status: Future Carbon Dioxide Emissions Reductions

The Global Warming Solutions Act of 2008 requires statewide reductions in greenhouse gas (CO2) emissions of 25 percent below 1990 levels by the year 2020, and 80 percent below 1990 levels by 2050.

The Commonwealth's thirteen metropolitan planning organizations (MPOs) are involved in helping to achieve greenhouse gas reductions mandated under the GWSA. The MPOs work closely with the Massachusetts Department of Transportation (MassDOT) and other involved agencies to develop common transportation goals, policies, and projects that would help to reduce GHG emission levels statewide, and meet the specific requirements of the GWSA regulation – *Global Warming Solutions Act Requirements for the Transportation Sector and the Massachusetts Department of Transportation (310 CMR 60.05).* The purpose of this regulation is to assist the Commonwealth in achieving their adopted GHG emission reduction goals by:

- Requiring each MPO to evaluate and report the aggregate GHG emissions and impacts of both its Regional Transportation Plan (RTP) and Transportation Improvement Program (TIP).
- Requiring each MPO, in consultation with MassDOT, to develop and utilize procedures to prioritize and select projects in its RTP and TIP based on factors that include GHG emissions and impacts.

Meeting the requirements of this regulation is being achieved through the transportation goals and policies contained in the 2020 RTPs, the major projects planned in the RTPs, and the mix of new transportation projects that are programmed and implemented through the TIPs.

The GHG evaluation and reporting processes enable the MPOs and MassDOT to identify the anticipated GHG impacts of the planned and programmed projects, and also to use GHG impacts as a criterion in prioritizing transportation projects. This approach is consistent with the

greenhouse gas reduction policies of promoting healthy transportation modes through prioritizing and programming an appropriate balance of roadway, transit, bicycle and pedestrian investments; as well as supporting smart growth development patterns through the creation of a balanced multi-modal transportation system. All of the MPOs and MassDOT are working toward reducing greenhouse gases with "sustainable" transportation plans, actions, and strategies that include (but are not limited to):

- Reducing emissions from construction and operations
- Using more fuel-efficient fleets
- Implementing and expanding travel demand management programs
- Encouraging eco-driving
- Providing mitigation for development projects
- Improving pedestrian, bicycle, and public transit infrastructure and operations (healthy transportation)
- Investing in higher density, mixed use, and transit-oriented developments (smart growth)

Regional GHG Evaluation and Reporting in RTPs

MassDOT coordinated with MPOs and regional planning agency (RPA) staffs on the implementation of GHG evaluation and reporting in development of each MPO's 2012 and 2016 RTPs. This collaboration has continued for the MPOs' 2020 RTPs and 2020-24 TIPs. Working together, MassDOT and the MPOs have attained the following milestones:

- Modeling and long-range statewide projections for GHG emissions resulting from the transportation sector, as a supplement to the 2020 RTPs. Using the newly updated statewide travel demand model, GHG emissions have been projected for 2020 no-build (base) and build (action) conditions, and for 2040 no-build (base) and build (action) conditions (see the chart in this section for the results of this modeling).
- All of the MPOs have addressed GHG emission reduction projections in their RTPs (including the statewide estimates in the chart that follows), along with a discussion of climate change and a statement of MPO support for reducing GHG emissions from transportation as a regional goal.

MassDOT's statewide estimates of CO_2 emissions resulting from the collective list of all recommended projects in all of the Massachusetts RTPs combined are presented in Table VIII-1 below. Emissions estimates incorporate the latest planning assumptions including updated socio-economic projections consistent with the 2020 RTPs:

Table VIII-1
Massachusetts Statewide Aggregate CO_2 Estimated Emissions Impacts from Transportation
(all emissions in tons per summer day)

Year	CO_2 Action Emissions	CO_2 Base Emissions	Difference (Action – Base)
2016	86,035.6	86,035.6	n/a
2020	75,675.6	75,865.9	-190.3
2040	54,484.2	54,702.2	-218.0

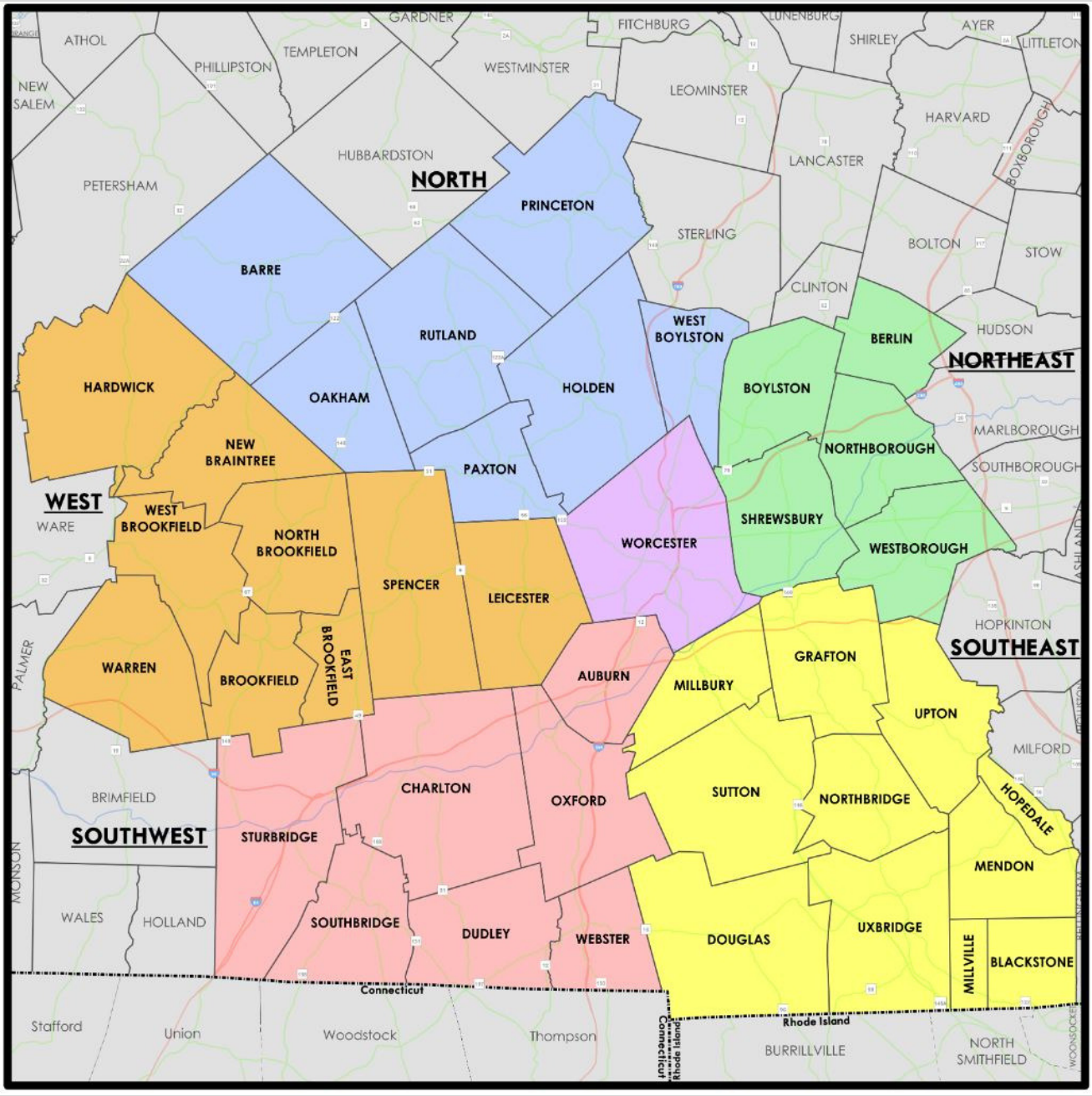
This analysis includes only those larger, regionally significant projects that are included in the statewide travel demand model. Many other types of projects that cannot be accounted for in the model (such as bicycle and pedestrian facilities, shuttle services, intersection improvements, etc.), are covered in each MPO region's RTP with either "qualitative" assessments of likely CO_2 change, or actual quantitative estimates listed for each project.

As shown above, collectively, all the projects in the RTPs in the 2020 Action scenario provide a statewide reduction of over 190 tons of CO_2 per day compared to the base case. The 2040 Action scenario estimates a reduction of 218 tons per day of CO_2 emissions compared to the base case.

These results demonstrate that the transportation sector is expected to continue making positive progress in contributing to the achievement of GHG reduction targets consistent with the requirements of the GWSA. MassDOT and the MPOs will continue to advocate for steps needed to accomplish the Commonwealth's long-term goals for greenhouse gas reductions.

Central Massachusetts Regional Planning Commission

Member Communities:



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