CENTRAL MASSACHUSETTS METROPOLITAN PLANNING ORGANIZATION (CMMPO)

Highway Freight Accommodation Assessment Study: Southwest Transportation Planning Subregion

CMMPO
Central Massachusetts
Metropolitan Planning Organization

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Central Massachusetts Regional Planning Commission

August 2023

Prepared in cooperation with the Massachusetts Department of Transportation and the U.S. Department of Transportation – Federal Highway Administration and the Federal Transit Administration. The views and opinions of the Central Massachusetts Regional Planning Commission expressed herein do not necessarily reflect those of the Massachusetts Department of Transportation or the U.S. Department of Transportation. A portion of this document was completed using District Local Technical Assistance (DLTA) funds provided to CMRPC.

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Preface

In order to assure that the federal-aid highway system in each of the Central Massachusetts Regional Planning Commission (CMRPC) transportation planning subregions is adequately accommodating existing trucking needs as well as those projected for the future, the Central Massachusetts Metropolitan Planning Organization (CMMPO) Unified Planning Work Program (UPWP) for FFY 2020 initiated a new study series, "Highway Freight Accommodation Assessments" for federal-aid State Numbered Routes. The first installment focused on the North subregion, the second edition concentrated on the West subregion, and this report focuses on the Southwest subregion. Based on both field observations and detailed analyses, this document provides a number of suggested roadway improvement options and local trucking policy considerations to assure the continued flow of freight on the region's major highways while mitigating identified local impacts.

Further, as noted in the MassDOT's 2018 *Massachusetts Freight Plan and reaffirmed in the Draft 2023 Massachusetts Freight Plan*, there is an identified need to improve the Commonwealth's stock of truck parking and servicing areas. The compilation of the *Highway Freight Accommodation Assessment* study series, supported by the Federal Highway Administration (FHWA), is intended to assist in addressing this identified statewide need. Accordingly, in the spirit of Jason's Law, this study examines the potential for wisely located increases in available truck parking at key locations of the region, with a particular focus on rural highway freight movement needs.

*The CMMPO Endorsed UPWP for 2023 includes the next installment in this study series that will focus on the **Southeast** transportation planning subregion.*

1.0 Introduction

The CMMPO's Endorsed 2022 UPWP Freight Planning work activity indicates the compilation of a *Highway Freight Accommodation Assessment Study: Highway Trucking on State Numbered Routes*. This study is the third in a planned series of subregional *Highway Freight Accommodation Assessment* studies. This trucking-centric study focuses on the region's federal-aid highway network in the Southwest transportation planning subregion. The Southwest subregion includes seven (7) host communities: Auburn, Charlton, Dudley, Oxford, Southbridge, Sturbridge, and Webster. A map of the Southwest subregion can be found in **Figure 1**.

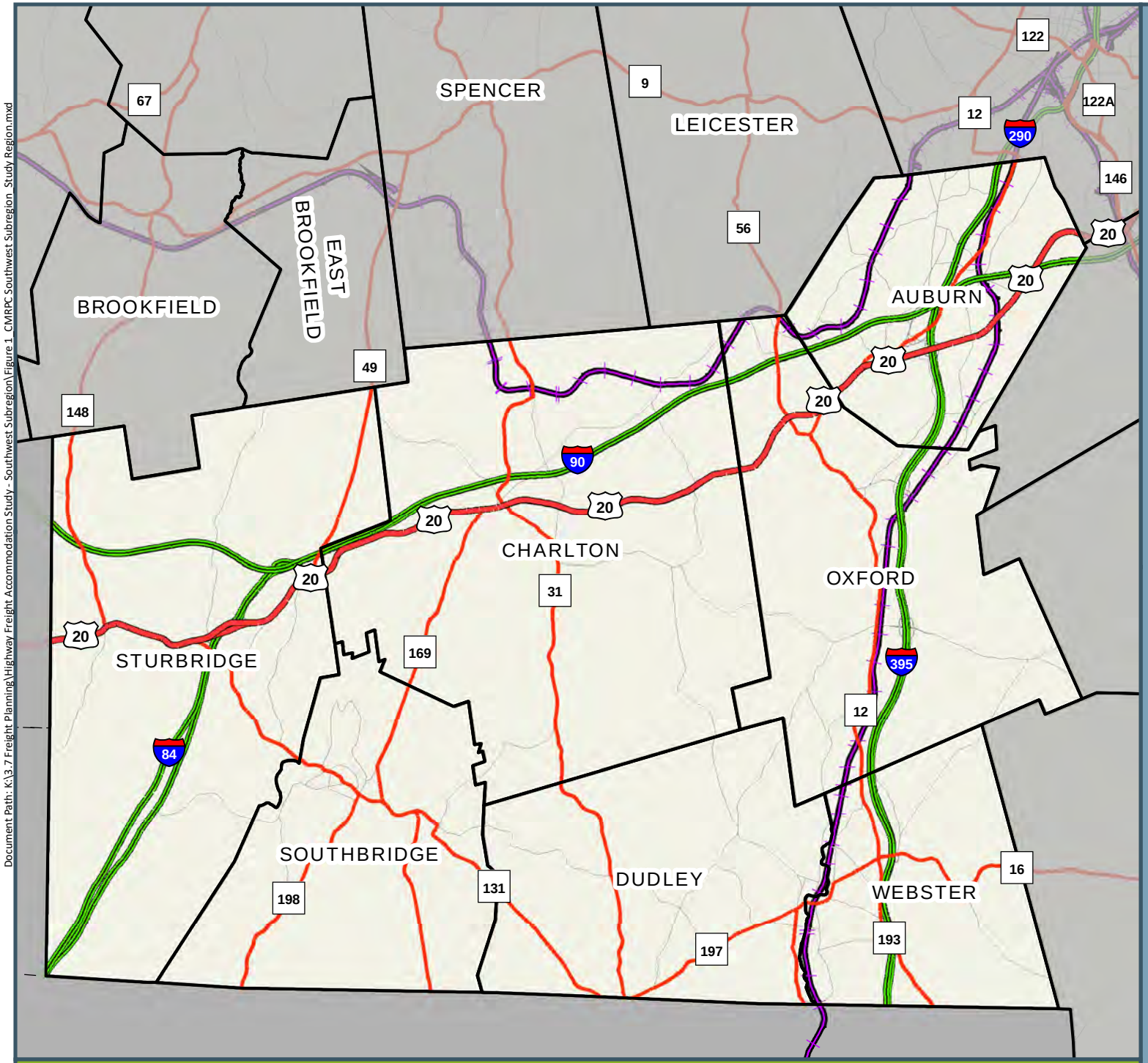
All eligible for federal-aid improvement funding, the following twelve (12) State Numbered Routes in the Southwest subregion are the focus of this study effort:

1. Route 12
2. Route 16
3. US Route 20
4. Route 31
5. Route 49
6. Route 56
7. Route 131
8. Route 148
9. Route 169
10. Route 193
11. Route 197
12. Route 198

Major topics addressed in this *Freight Accommodation Assessment Study* include a subregional trucking amenities overview, an inventory of host community bylaws affecting local trucking operations, federal-aid highway network traffic volumes & truck percentages, a range of Management Systems (MS) data & analysis, Performance-Based Planning & Programming (PBPP) considerations, subregional Environmental Consultation maps and local Municipal Vulnerability Preparedness (MVP) Plan findings. In addition, the regional Travel Demand Model, a computerized simulation of the region's multi-modal transportation network, provided future-year volume projections for a range of truck classifications, verifying known highway freight routes as well as identifying area of concentrated local trucking activity.

Based on this broad range of data, observations and corresponding analysis, a summary of findings table is presented. The *Highway Freight Accommodation Assessment Study* concludes with a series of suggested recommendations for both MassDOT and host community

consideration. These include both local policy suggestions as well as options for roadway and bridge improvements. Some identified improvement projects may have the potential to utilize future-year TIP funding available to the CMMPO to assist state or local implementation. Suggested projects are intended to help assure the continued flow of highway freight throughout the greater planning region while mitigating identified local impacts.



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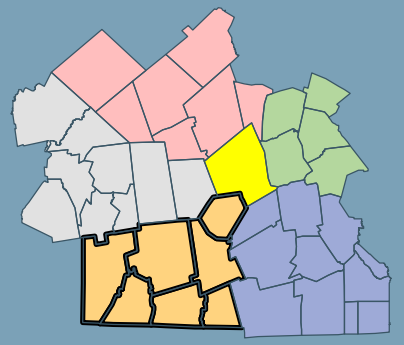

Legend

- Southwest Subregion Towns
- Active Railroads
- Interstate
- US Highway
- State Route
- Other Major Roads

N

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FIGURE 1 - SOUTHWEST SUBREGION HOST COMMUNITIES

1.1 Area Trucking Amenities

Parking for Long-Distance Highway Trucking

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 be addressed to ensure the continued safe flow of freight on the nation's network of major highways.

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.

Jason's Law federally mandates adequate rest periods for long-distance truck drivers. Adequate truck parking opportunities *must* be available to serve both the Commonwealth's existing and future projected needs. Looking to the future, efforts to increase the available supply of parking for long-distance trucking in the planning region need to continue. Both nationally and statewide, truck parking will continue to be a challenge and will require FHWA's and MassDOT's concerted, ongoing involvement. This could involve state & local policy changes that mandate addressing these needs, through both revised policy & regulation in addition to improved infrastructure. The CMMPO is *serious* concerning the implementation of Jason's Law to provide sufficient truck parking and, as such, encourages MassDOT to continue to address this critical area of concern.

MassDOT's earlier *2018 Massachusetts Freight Plan* indicated the Commonwealth's deficiency in providing enough modern, full-service rest stops catering to trucking. There exists the potential for expanded existing or new additional facilities in the planning region for large truck parking to enable drivers to meet the federally-required rest periods. Parking has the potential to be offered on a guaranteed, reservation-style basis, perhaps with basic amenities. As indicated in the Long-Range Transportation Plan (LRTP) for the region, *2050 Connections*, the CMMPO supports the implementation of additional modern, full-service rest stops throughout the greater region serving the trucking industry.

MassDOT Efforts to Improve Truck Parking Supply

In the spirit of Jason's Law, MassDOT is actively seeking to increase the amount of safe parking available for long-distance trucking activities in the Commonwealth. Initially, an inventory was compiled of the state's truck parking supply as well as parking availability/usage. An analysis of this data allowed for the suggestion of potential new truck parking facilities at 12 sites across 3 target areas of the state. Similarly, the potential also exists to expand the parking supply at an additional 12 sites along both the MassPike (I-90) and I-95 corridors. The use of Intelligent Transportation Systems (ITS) considers available technologies for producing and relaying real-time truck parking occupancy data.

The MassDOT evaluation criteria for potential *new* truck parking included the number of available acres, right-of-way impacts, the distance from the nearest highway interchanges, as well as potential impacts to any nearby historic and environmental resources. High-level cost analysis screening was also conducted for the 12 sites considered in the study effort. Similarly, the MassDOT evaluation criteria for potential *expanded* truck parking evaluation criteria also included the number of available acres, feasibility of constructability, and any likely impacts to nearby environmental resources. Further, the top-ranked six (6) sites were also assessed using available truck probe data and historic traffic data.

Within the CMRPC planning region, sites for potential new truck parking are being considered and further analyzed by MassDOT along the I-395 corridor in the host communities of both Oxford and Webster. In addition, in the Northeast planning subregion, MassDOT is considering a site for new truck parking in the town of Berlin. Another new site is being considered in the adjacent town of Bolton, just north of the planning region. Elsewhere, at three (3) existing sites along the MassPike (I-90) corridor, MassDOT has deployed ITS technologies to monitor truck activity. The three (3) sites on the MassPike that are targeted for the potential expansion of the existing parking supply for long-distance trucking are both Charlton rest plazas, eastbound and westbound, within the Southwest planning subregion as well as the eastbound Natick rest plaza, east of the planning region. MassDOT has also developed concept sketches and cost estimates for each potential expansion site on the MassPike.

The new updated state Freight Plan to be completed by MassDOT in 2023 is anticipated to include further recommendations concerning the ongoing effort to increase the supply of safe parking available for long-distance trucking activities throughout the Commonwealth.

MassDOT Weigh Station Truck Parking Opportunities

It is suggested that both underutilized or dormant MassDOT Weigh Station infrastructure along the region's federal-aid highways could potentially assist long-distance truck drivers in meeting the federally-mandated rest period requirements. These paved and gated, yet often-empty,

Weigh Stations could potentially present opportunities for large truck parking. Based on staff's cursory research, not all Weigh Stations are currently in use, as activity levels appear to vary over time. Further, other opportunities for large truck parking may exist on other dormant or surplus MassDOT-owned properties throughout the Commonwealth.

The following is a list of roadside MassDOT Weigh Stations identified in the greater planning region:

Charlton: I-90 (MassPike) Eastbound
Lancaster: Route 2 Eastbound *(currently used for MassDOT construction staging)*
Sturbridge: I-84 (Wilbur Cross Highway) Eastbound
Sturbridge: I-84 (Wilbur Cross Highway) Westbound
Uxbridge: Route 146 Northbound

In addition, based on CMMPO staff research, MassDOT currently maintains six (6) Weigh-in-Motion Stations statewide. The location of the Weigh-in-Motion Stations are as follows:

- **Attleborough**: I-95 north of I-295
- **Hatfield**: I-91 north of Chestnut Street
- **Ludlow/Springfield**: I-90 (MassPike) between exits 6 and 7
- **Methuen**: I-93 north of Routes 110/113
- **Sturbridge**: I-84 Westbound (Wilbur Cross Highway) Connecticut state line
- **Worcester**: I-190 south of West Mountain Street

Truck Parking Opportunities near Trucking Activity Centers

It is considered an ongoing challenge for long-distance truckers to seek and locate modest parking opportunities, especially in the more rural areas of the planning region. The CMMPO staff has considered outputs from the regional Travel Demand Model to assist in identifying trucking "hot spots" in the region, helping to target potential locations for needed future truck parking opportunities. At this time, staff has identified potential truck parking opportunities for federally-required driver rest in the Southwest subregion at the following locations, one in each of the seven (7) host communities encompassed in this study:

- **Auburn:** Auburn Mall Parking Lot
- **Charlton:** US Route 20 Corridor
- **Dudley:** Route 197 Corridor
- **Oxford:** Sutton Avenue Near I-395
- **Southbridge:** Southbridge Municipal Airport
- **Sturbridge:** US Route 20 Corridor
- **Webster:** Route 16 Corridor
- *OTHERS UNDER REVIEW, To Be Determined*

As an example, staff seeks opportunities for large truck parking 24/7 in underutilized "big box" or shopping plaza parking lots and/or designated loading/maneuvering areas. Staff seeks to suggest local community bylaw refinements/additions to allow for controlled long-distance truck parking when store deliveries meet certain thresholds at various retail & industrial establishments. An example is the Walmart model used elsewhere in the nation: overnight parking welcome, in a supervised/monitored and maintained facility. Common courtesy by users to minimize emissions, noise and trash is expected.

Additionally, the needed expansion/addition of available rest stops for long-distance trucking may have the opportunity to be supported through private sector funding or, alternately, benefit from a "Public-Private Partnership" (PPP) funding scenario, where private funding is used to leverage designated public monies. Future potential PPP arrangements could include the following aspects:

- Rest stop construction & management
- Truck hook-ups for electrical power (vastly reducing idling)
- Diesel & alternate fuel sales
- Light repair facilities
- Dining options & lavatories
- Other locally-customized features

Availability of Diesel Fuel in the Southwest Subregion

Staff has conducted research to identify existing substantive diesel fueling opportunities in the planning region. This information is useful for long-distance trucking as well as for emergency situations that could strike the region. The Massachusetts Department of Environmental Protection (DEP) maintains a database of permitted locations for diesel storage.

This information for the seven (7) host communities in the Southwest transportation planning subregion was extracted from the DEP database and is shown in **Table 1**. Based on the DEP information, at this time there are thirty-one (31) commercial outlets in the Southwest transportation planning subregion providing diesel fuel sales. As can be seen from the table, there are at least two (2) diesel stations in all seven (7) communities.

Table 1

Diesel Fuel Locations in the Southwest Subregion

Facility Name	Facility Address	Host Community
Cumberland Farms #2449	502 Washington Street	Auburn
BJ's Wholesale Club	782 Washington Street	Auburn
MA0054	860 Southbridge Street	Auburn
Charlton Gas & Market LLC	28 Worcester Road	Charlton
Global Montello Group #2761	38 Worcester Road	Charlton

Facility Name	Facility Address	Host Community
Gulf Oil Limited #3907	MM 83.8 WB MA Turnpike	Charlton
Gulf Oil Limited #3906	MM 80.4 EB MA Turnpike	Charlton
Patriot Gas	251 West Main Street	Dudley
Hi Lo Gas	5 West Main Street	Dudley
Oxford Shell	138 Southbridge Road	Oxford
Oxford Sunoco	366 Main Street	Oxford
Zam Zam Mart LLC	484 Main Street	Oxford
Global Montello Group #664	123 Sutton Avenue	Oxford
Global Montello Group #2759	24 Sutton Avenue	Oxford
North Oxford Xtra Mart	93 Southbridge Road	Oxford
Cumberland Farms #2517	357 Main Street	Southbridge
Daous Convenience	716 Worcester Street	Southbridge
Southbridge Xtra Mart	465 East Main Street	Southbridge
OM Mobil Mart Inc.	491 East Main Street	Southbridge
Cumberland Farms #2131	506 Main Street	Sturbridge
Pilot Travel Center #222	400 Haynes Street	Sturbridge
Sturbridge Gas	173 Main Street	Sturbridge
C&R Tire CO of Sturbridge Inc.	649 Main Street	Sturbridge
Heritage Xtra Mart	215 Charlton Road	Sturbridge
236 Route 15 – MA0006	236 Route 15	Sturbridge
Lucky Mart	122 Main Street	Sturbridge
Gama Gas D/B/A Hi-Lo Gas	82-92 Main Street	Webster
Global Montello Group #3827	188 Gore Road	Webster
MA0027	88 East Main Street	Webster
Webster Xtra Mart	74 East Main Street	Webster
Webster Energy North #2123	144 Thompson Road	Webster

1.2 Host Community Bylaws Concerning Trucking

Staff reviewed local community bylaws for the Southwest subregion towns, seeking any pertaining to truck prohibitions, delivery hour restrictions, parking prohibitions or any other locally-defined rules concerning large commercial vehicles, such as local "Jake Brake" use discouragement. *(The phrase "Jake Brake" is slang for engineered safety devices for modern truck tractors that use an engine compression brake that closes the valves in an engine for added slowing ability.)* Based on staff research, it was determined that only the town of Auburn in the Southwest subregion has local bylaws governing trucking operations.

Auburn – (20) Operation of Heavy Commercial Vehicles

(A) The use and operation of heavy commercial vehicles having a carrying capacity of more than two- and one-half tons are hereby prohibited on the following named streets or parts thereof:

I. Faith Avenue, beginning at Washington Street to the intersection with Southbridge Street.

(B) The use and operation of heavy commercial vehicles having a carrying capacity of more than five (5) tons are hereby prohibited on the following named streets or parts thereof:

I. Heard Street: beginning at North Oxford Street to the Worcester City Line.

II. Bryn Mawr Avenue: beginning at 178 North Oxford Street to Warren Road.

III. Warren Road: from Bryn Mawr Avenue to Southbridge Street.

IV. Waterman Road: from Warren Road to Southbridge Street.

(C) Exemptions: Sections (20) (A) and (B) shall not apply to heavy commercial vehicles going to or coming from places upon said streets for the purpose of making deliveries of goods, materials, or merchandise to or similar collections from abutting land or buildings or adjoining streets or ways to which access cannot otherwise be gained; or to vehicles used in connection with the construction, maintenance and repair of said streets or public utilities therein; or to Federal, State, Municipal or public service corporation owned vehicles.

(D) Enforcement: Sections (20) (A) and (B) shall be effective only during such time as sufficient number of official signs are erected so that at least one (1) sign will be clearly visible for at least seventy-five (75) feet to drivers approaching each exit.

Charlton – None Posted

Dudley – None Posted

Oxford – None Posted

Southbridge – None Posted

Sturbridge – None Posted

Webster – None Posted

The CMRPC Regional Collaboration & Community Planning (RCCP) staff has broad experience in crafting local community bylaws, village bylaws, and other similar documentation for various host communities. When necessary, these bylaws can be customized to account for local trucking activities, deliveries, and parking as well as other related activities.

2.0 State Numbered Routes

This section of the *Southwest Subregion Highway Freight Accommodation Study* details the primary focus network of State Numbered Routes owned and maintained by either MassDOT or the host communities. These highways are eligible for federal-aid improvement funding through the CMMPO's Transportation Improvement Program (TIP). Currently programmed TIP projects in the Southwest subregion are also listed. Further, the CMMPO's previously designated Critical Freight Corridors are summarized. Lastly, field-observed traffic volumes and associated truck percentages are presented.

2.1 Analysis Network

As previously stated, all State Numbered Routes eligible for federal-aid improvement funding in the Southwest subregion are the primary focus of the study effort. Other federal-aid town-owned & maintained highway segments have also been also included in the study scope, often serving as connectors between the State Numbered Routes. Again, the following twelve (12) State Numbered Routes in the Southwest subregion are the focus of this analysis: Route 12, Route 16, US Route 20, Route 31, Route 49, Route 56, Route 131, Route 148, Route 169, Route 193, Route 197, and Route 198. Segments of these highways that were previously designated by the CMMPO as Critical Freight Corridors are also identified.

Federal-Aid Eligible Road Classifications & Highway Ownership

Figure 2 shows the federal-aid eligible highways in the Southwest subregion. Funds are allocated from the FHWA to MassDOT to be distributed to the state's MPO's for roadway improvement projects through the regional TIPs. A combination of functional classification and urban/rural designation determines if a roadway qualifies for the use of these federal funds. Eligibility includes all Interstates, urban/rural arterials, urban collectors, and rural major collectors. Rural minor collectors and local roads are excluded from this group and thus ineligible for federal-aid highway funding.

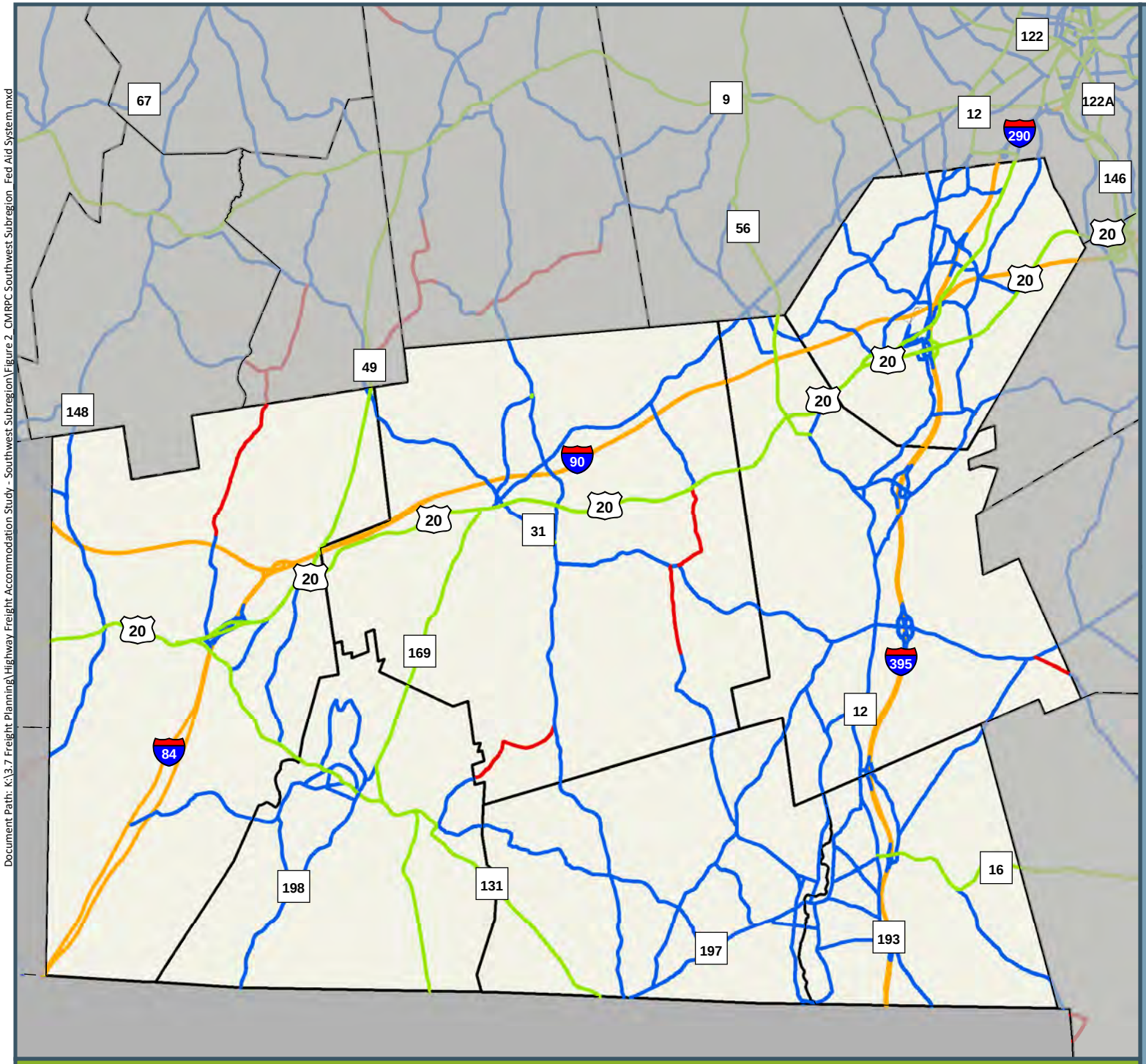
As shown on the map there are four categories of federal-aid eligible roads. There are two (2) National Highway System (NHS) categories and two (2) Surface Transportation Program (STP) categories. The NHS-funded highway network represents all Interstate roadways and principal arterials throughout Massachusetts. In addition, roadways connecting the NHS roadways with military bases are also considered part of the NHS network. Also, NHS passenger & freight terminals are connected to the NHS network by roadways called "NHS Connectors".

The STP-funded highway network is comprised of any functionally classified roadway. STP-funded roadways include all urban arterials, urban collectors, and rural arterials. According to

prior national transportation legislation, rural collectors are also STP eligible, but have a limitation on the amount of STP funding allocated to the states that can be used. These types of roads are classified in what is called the "C15" category.

There are four (4) Interstate NHS highways within the Southwest transportation planning subregion: Interstate 84, Interstate 90 (Massachusetts Turnpike), Interstate 290, and Interstate 395. However, being a MassDOT-operated toll road, Interstate 90 in Massachusetts is ineligible for federal-aid. Highways in the Southwest subregion eligible for NHS funding include Routes 12, 16, US 20, 49, 56, 131, and 169. The remaining State Numbered Routes included in this Accommodation Assessment Study are STP-eligible and include Routes 31, 148, 193, 197, and 198. Other major roadways within the Southwest subregion shown on the figure are classified as either STP-eligible or STP – C15.

In addition, **Figure 3** shows the highway ownership for the State Numbered Routes and other major roadways in the Southwest subregion. As can been seen in the figure, most of the highways are owned, and thus maintained, by the seven (7) host communities. The entirety of Interstate 84, Interstate 90 (Massachusetts Turnpike), Interstate 290, Interstate 395, US Route 20, Route 49 as well as portions of Route 12, Route 131, Route 169, Route 193, and Route 197 are the major highways in the Southwest subregion owned and maintained by MassDOT.



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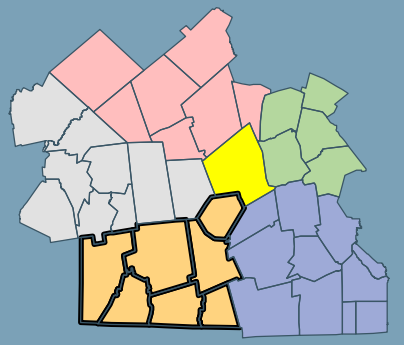

Legend

- Southwest Subregion Towns
- Interstate - NHS
- Other Road - NHS
- STP Eligible
- STP Road - C15

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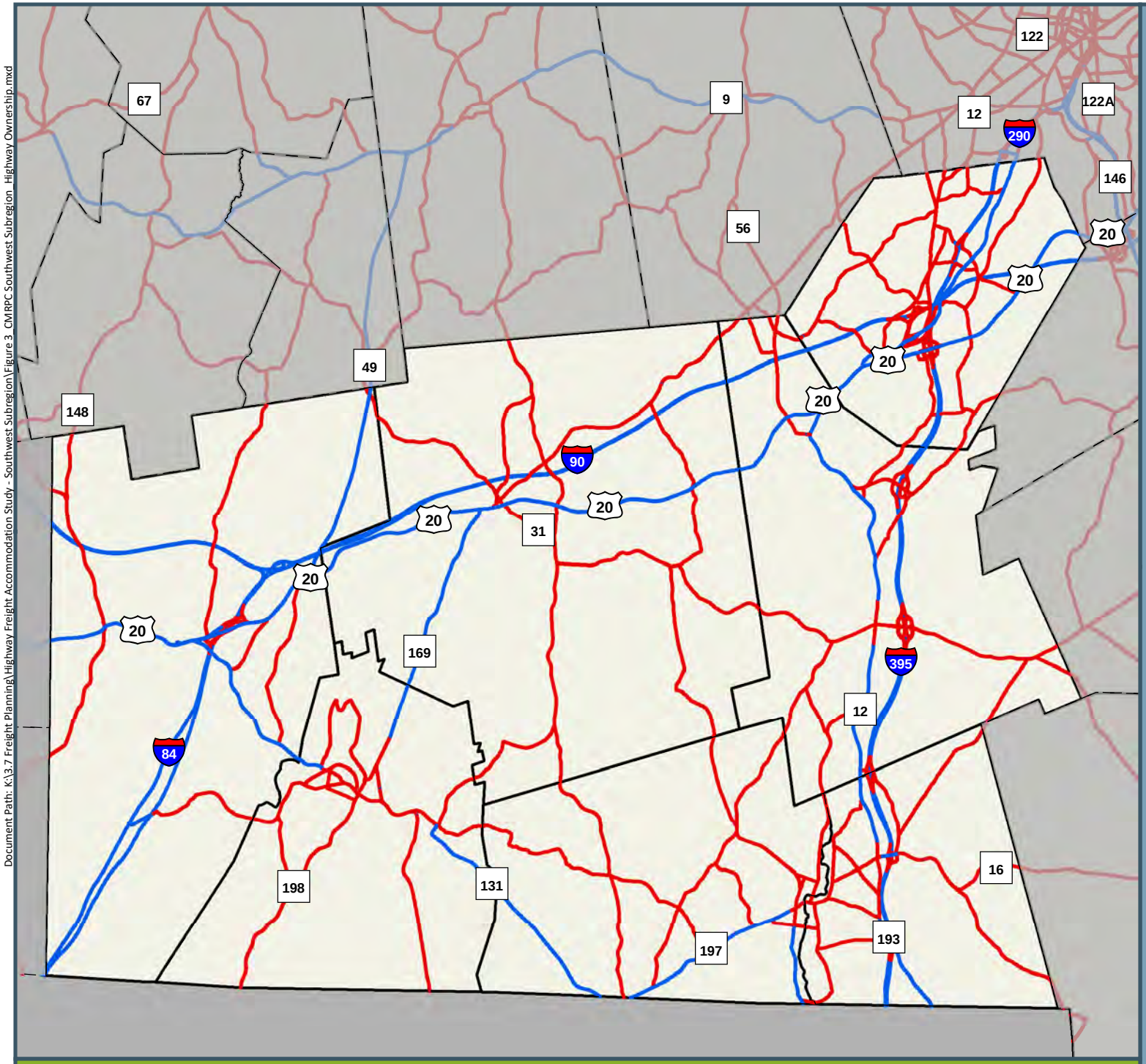
FIGURE 2 - SOUTHWEST SUBREGION FEDERAL-AID ELIGIBLE ROAD CLASSIFICATIONS



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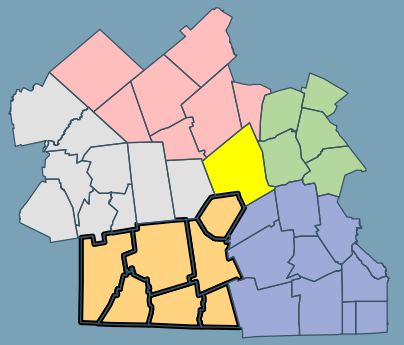

Legend

- Southwest Subregion Towns
- City or Town accepted road
- MassDOT Owned

N

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FIGURE 3 - SOUTHWEST SUBREGION ROADWAY OWNERSHIP

Environmental Justice & Vulnerable Populations

Environmental Justice (EJ) was first noted on the Executive Order 12898 (1994) which mandated all federal agencies to ensure that their programs do not disproportionately cause high and adverse effects on minority and low-income populations and to ensure that all potentially affected populations have the opportunity to full and fair participation in the transportation decision-making process. Moreover, the US Department of Transportation (DOT) Order 5610.2(a) presents DOT policy to consider EJ in all programs, policies, and activities with the US DOT. The guiding principles in DOT's national policy are:

- To avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects on minority populations and low-income populations.
- To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.
- To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations.

To carry out the intent of the federal guidance, it was necessary to identify low income and minority communities or neighborhoods in the planning region. The CMMPO updated and approved the current EJ definition in November 2022 to reflect regional characteristics and demographic changes based on the decennial US Census. With the update, the term EJ is now being referred to as Regional Environmental Justice "Plus" (REJ+) Community. A REJ+ community is a designation assigned to block groups with relatively high shares of residents that are especially impacted by changes and or to transportation networks. This designation is "regional" in nature because the socioeconomic characteristics that designate REJ+ status are considered in relation to regional percentiles (through comparing block group characteristics to MPO-level percentiles rather than statewide percentiles); the designation is called "plus" because it includes characteristics beyond traditional "environmental justice" definitions to identify the most dominant factor that defines a community's social vulnerabilities. The definition reads as follows:

- To qualify as an REJ+ community, a block group must meet the following thresholds that correspond to traditional EJ criteria. All data used for this analysis was retrieved from the U.S. Census in which the unit of analysis is census block groups (ACS 2021 5-year estimates)
    - **Income**: Annual median household income $\leq$ MPO 25th percentile.
    - **Race & Ethnicity**: Percent of individuals that identify as Hispanic or Latino; Black or African American; American Indian or Alaska Native; Asian; Native Hawaiian or

Other Pacific Islander; Some other race; or Two or more races and do not identify as White alone ≥ MPO 75th percentile.

- **Limited English Proficiency (LEP)**: Percent of households with LEP speaking members ≥ MPO 75th percentile.

- While the community characteristics that traditionally define EJ communities to establish areas that are particularly vulnerable to social, economic, and political pressures are relied upon, it is also recognized that these characteristics do not capture other socio-economic contexts that indicate area of high need with respect to transportation issues. Therefore, the "most dominant factor" that drives transportation and accessibility needs in each community is calculated and identified, the following "plus" element characteristics are also included for this determination:
  - **Car Ownership**: Percent of households without an available vehicle ≥ MPO 75th percentile.
  - **Disability**: Percent of households with one or more persons with a disability ≥ MPO 75th percentile.
  - **Age**: Percent of individuals aged 65 or older ≥ MPO 75th percentile.

The REJ+ thresholds were developed for each MPO region to control the regional differences in socio-economic and demographic characteristics across the Commonwealth. The thresholds were calculating the Quartile function in Excel to determine each MPO-specified threshold value within each EJ or "Plus" category. Block group-level values for each characteristic are then compared to their respective MPO thresholds to determine if the block group meets the criteria for REJ+ designation. **Table 2** shows the CMMPO identified thresholds:

Table 2 – CMMPO REJ+ Thresholds

MPO	Income	Nonwhite	LEP	Disability	Zero-Vehicle	Senior
Central Mass	$60,921	41%	8%	32%	14%	21%

For block groups that are identified as REJ+ communities, the "most dominant" of the six characteristics was identified in terms of the greatest dissimilarity or distance from the MPO threshold. This identification provides a deeper sense of the social contexts that shape local transportation needs. Knowing that an REJ+ community's most dominant factor is a lack of automobile access, or a high proportion of individuals with physical disabilities, or a high share of older individuals, gives a greater insight into the programs, initiatives, or investments that can be made to promote accessibility and mobility for those who may need extra support. **Figure 4** shows the REJ+ populations in the Southwest planning subregion.

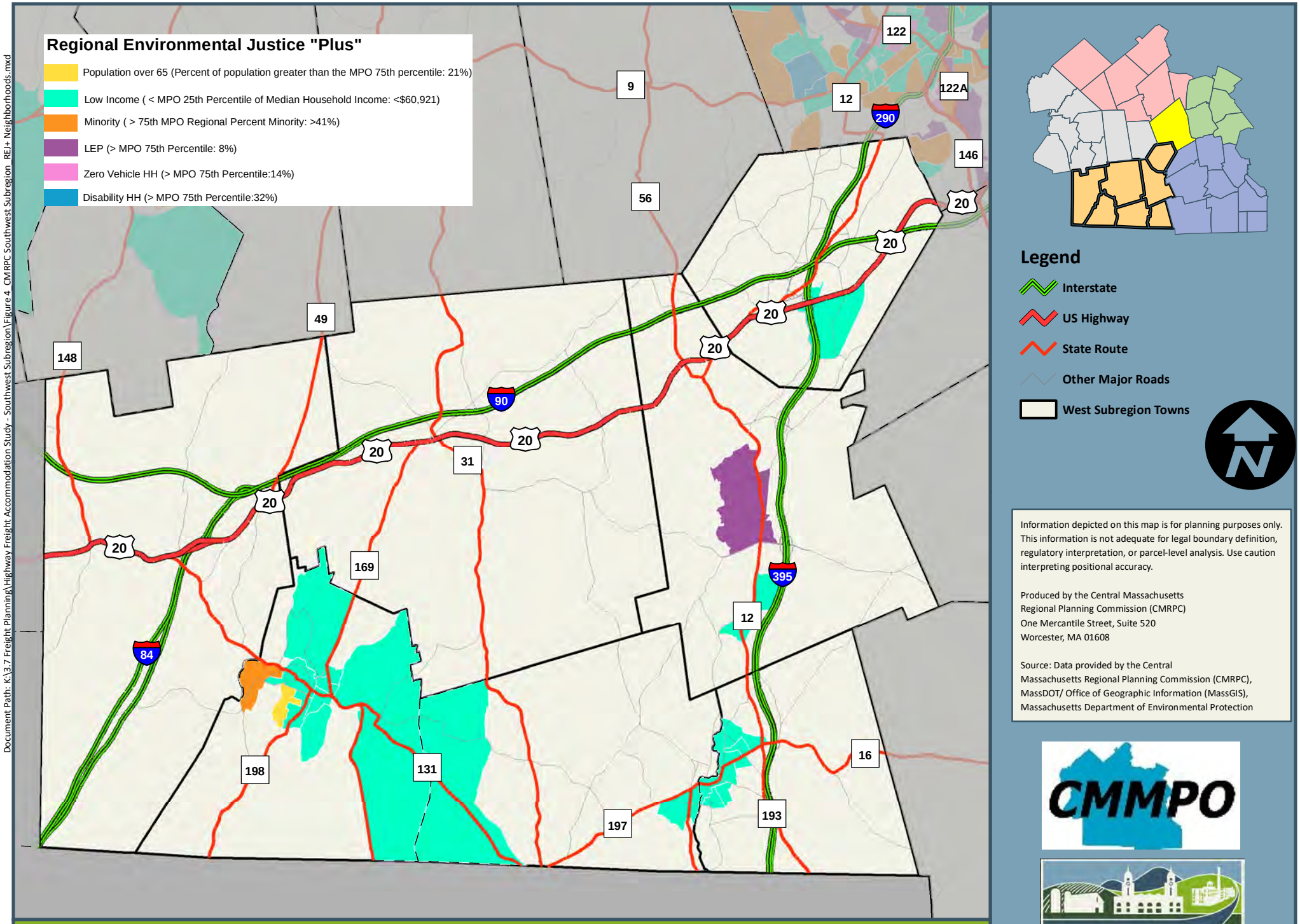
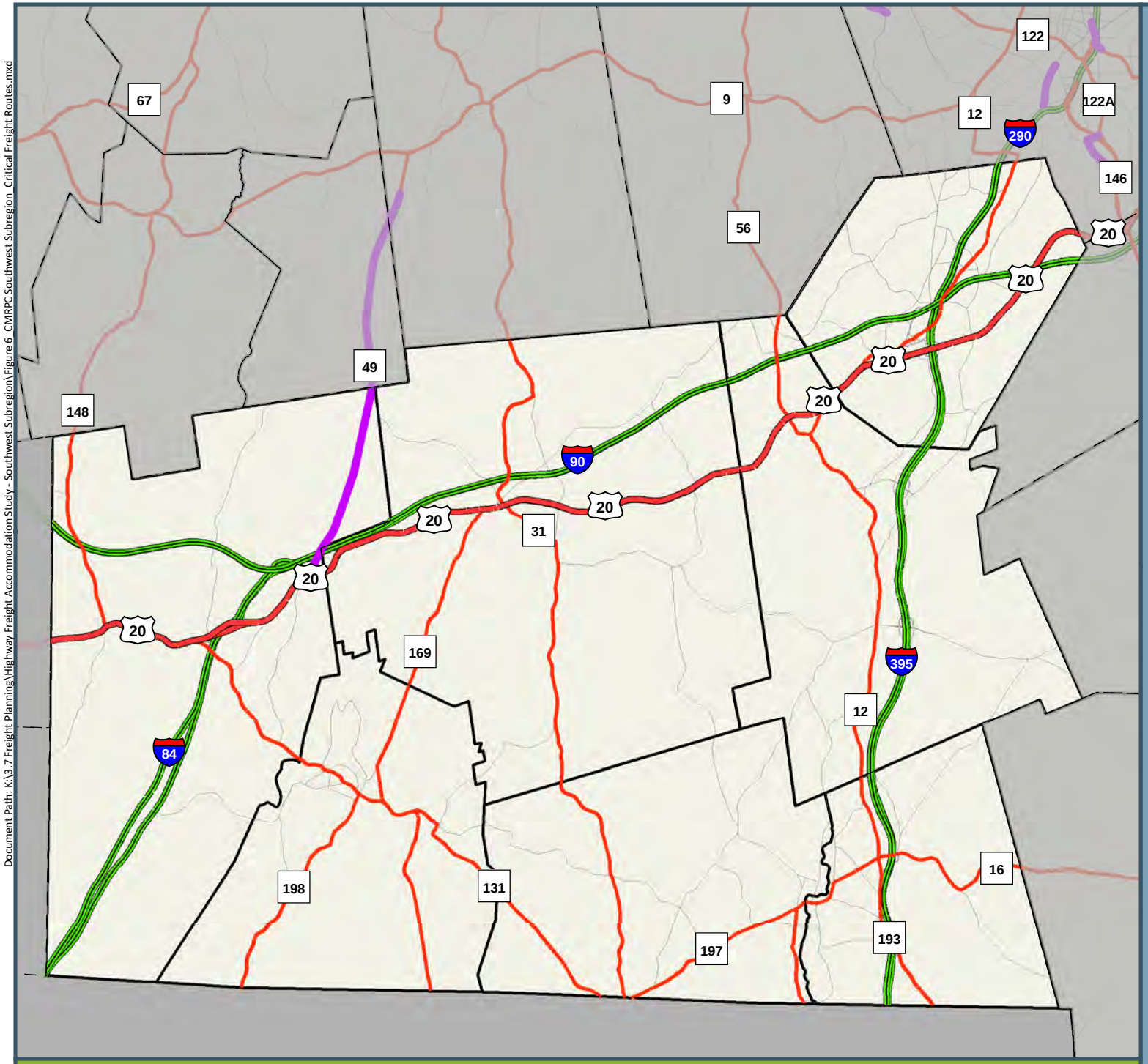


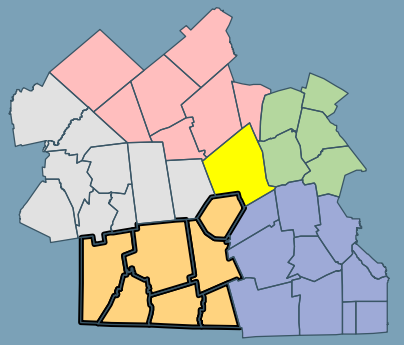
FIGURE 4 - SOUTHWEST SUBREGION REGIONAL ENVIRONMENTAL JUSTICE "PLUS" POPULATIONS

Critical Freight Corridors

As part of the development of the state's 2018 *Massachusetts Freight Plan*, the CMMPO staff took an active role, as requested by MassDOT Office of Transportation Planning (OTP), in designating "Critical Rural & Urban Freight Corridors". This exercise reaffirmed existing while also defined new major highway freight routes in the planning region connecting to the NHS. As requested by MassDOT OTP, staff completed the process of identifying (reaffirming in many cases) primary highway freight routes throughout the region, delineating between those roadways in the urban and rural areas. As part of this exercise, the region also needed to meet MassDOT OTP-allocated mileage parameters established for each of the state's planning regions. The CMMPO region was allocated six (6) urban miles and 23 rural miles.

As shown in **Figure 5**, there is a portion of one (1) Critical Rural Freight Corridor within the Southwest subregion. It is located within the community of Sturbridge. The Critical Rural Freight Corridor designated by the CMMPO is Route 49, between the CSX Railroad bridge in Spencer to the Interstate 90 (Massachusetts Turnpike) bridge in Sturbridge. The portion located in the Southwest subregion is between the East Brookfield town line and Interstate 90.





Legend

- Critical Rural Freight Corridor
- Interstate
- US Highway
- State Route
- Other Major Roads
- Southwest Subregion Towns

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Document Path: K:\3.7 Freight Planning\Highway Freight Accommodation Study - Southwest Subregion\Figure 6_CMRPC Southwest Subregion_Critical Freight Routes.mxd

FIGURE 5 - SOUTHWEST SUBREGION CRITICAL RURAL FREIGHT CORRIDORS

2.2 Transportation Improvement Program (TIP) Projects

The TIP is a federally-required planning document that lists all highway, bridge, transit, bicycle & pedestrian, and intermodal projects in the CMMPO's planning region that are programmed to receive federal-aid funding. Projects that improve air quality and safety are included in the TIP as well as projects of regional & statewide significance. Non federal-aid (NFA) projects, fully funded by the state, are also included for information purposes. Aware of limited statewide transportation funding resources, the CMMPO's annual program of projects must demonstrate financial constraint within the federal-aid funding targets provided by MassDOT OTP.

Table 3 lists the Southwest subregion's TIP projects that are programmed in the federal fiscal years 2023 – 2027. As can be seen in the table, there are fifteen (15) projects programmed for federal-aid funding in the Southwest subregion. The Charlton/Oxford US Route 20 Reconstruction project is an Advanced Construction (AC) project and is programmed from FFY 2022 to FFY 2025 and has multiple funding sources. AC is used when the cost of a project is too large to be programmed in a single fiscal year. The total cost of the US Route 20 project is over $78 million. In addition to the major Route 20 project, there are seven (7) bridge replacement projects, two (2) intersection improvement projects, three (3) pavement projects, and two (2) roadway reconstruction projects. All communities in the Southwest subregion have at least one programmed TIP project.

Table 3

Central Mass Region TIP Projects (2023-2027)

STIP: 2023 - 2027 (D)

Year	MassDOT Project ID	MPO	Municipality	MassDOT Project Description	District	Funding Source	Total Programmed Funds	Federal Funds	Non-Federal Funds	Other Information
Roadway Reconstruction										
2023	602659	Central Mass	Multiple	CHARLTON- OXFORD- RECONSTRUCTION ON ROUTE 20, FROM RICHARDSON'S CORNER EASTERLY TO ROUTE 12, INCLUDES REHAB OF C-06-023 & REPLACEMENT OF O-06-002	3	STBG	$1,768,000	$1,414,400	$353,600	Construction, Total Project Cost = $78,222,752, Project is AC'd between 2022 and 2025, PM Score = 22, Design Status = Advertised
2023	602659	Central Mass	Multiple	CHARLTON- OXFORD- RECONSTRUCTION ON ROUTE 20, FROM RICHARDSON'S CORNER EASTERLY TO ROUTE 12, INCLUDES REHAB OF C-06-023 & REPLACEMENT OF O-06-002	3	NHPP	$43,500,000	$34,800,000	$8,700,000	Construction, Total Project Cost = $78,222,752, Project is AC'd between 2022 and 2025, PM Score = 22, Design Status = Advertised
Earmark Discretionary										
2023	602659	Central Mass	Multiple	CHARLTON- OXFORD- RECONSTRUCTION ON ROUTE 20, FROM RICHARDSON'S CORNER EASTERLY TO ROUTE 12, INCLUDES REHAB OF C-06-023 & REPLACEMENT OF O-06-002	3	CRRSAA	$2,600,000	$2,600,000	$0	Construction, Total Project Cost = $78,222,752, Project is AC'd between 2022 and 2025, PM Score = 22, Design Status = Advertised
Bridge Off-system										
2023	610826	Central Mass	Sturbridge	STURBRIDGE- BRIDGE REPLACEMENT, S-30-019, CHAMPEAUX ROAD OVER LONG POND	3	STBG-BR-Off	$3,177,917	$2,542,334	$635,583	Construction, Total Project Cost = $3,177,917, Design Status = 75%
Intersection Improvements										
2024	608778	Central Mass	Southbridge	SOUTHBRIDGE- INTERSECTION IMPROVEMENTS AT CENTRAL STREET, FOSTER STREET, HOOK STREET AND HAMILTON STREET	3	CMAQ	$2,000,000	$1,600,000	$400,000	Construction, CMAQ + HSIP + STBG Total Project Cost = $5,417,513, Design Status = 75%, PM Score = 14, YOE = 4%
2024	608778	Central Mass	Southbridge	SOUTHBRIDGE- INTERSECTION IMPROVEMENTS AT CENTRAL STREET, FOSTER STREET, HOOK STREET AND HAMILTON STREET	3	HSIP	$883,756	$795,380	$88,376	Construction, CMAQ + HSIP + STBG Total Project Cost = $5,417,513, Design Status = 75%, PM Score = 14, YOE = 4%
2024	608778	Central Mass	Southbridge	SOUTHBRIDGE- INTERSECTION IMPROVEMENTS AT CENTRAL STREET, FOSTER STREET, HOOK STREET AND HAMILTON STREET	3	STBG	$2,533,757	$2,027,006	$506,751	Construction, CMAQ + HSIP + STBG Total Project Cost = $5,417,513, Design Status = 75%, PM Score = 14, YOE = 4%

Table 3

Central Mass Region TIP Projects (2023-2027)

STIP: 2023 - 2027 (D)

Year	MassDOT Project ID	MPO	Municipality	MassDOT Project Description	District	Funding Source	Total Programmed Funds	Federal Funds	Non-Federal Funds	Other Information
Bridge Off-system										
2024	608862	Central Mass	Southbridge	SOUTHBRIDGE- BRIDGE REPLACEMENT, S-21-009, MILL STREET OVER MCKINSTRY BROOK & S-21-003, MILL STREET OVER THE QUINEBAUG RIVER	3	STBG-BR-Off	$4,528,755	$3,623,004	$905,751	Construction, Total Project Cost = $4,528,755, Design Status = Approved, YOE = 4%
Bridge On-system NHS										
2024	609186	Central Mass	Dudley	DUDLEY - BRIDGE REPLACEMENT, D-12-026, STATE ROUTE 131 OVER THE QUINEBAUG RIVER	3	NHPP	$11,302,179	$9,041,743	$2,260,436	Construction, Total Project Cost = $11,302,179, Design Status = Approved, YOE = 4%
Interstate Pavement										
2024	612087	Central Mass	Auburn	AUBURN- RESURFACING AND RELATED WORK ON I-290 AND I-395	3	NHPP	$5,980,000	$4,784,000	$1,196,000	Construction, Total Project Cost =$5,980,000, Design Status = Approved, YOE = 4%
Roadway Reconstruction										
2024	602659	Central Mass	Multiple	CHARLTON- OXFORD- RECONSTRUCTION ON ROUTE 20, FROM RICHARDSON'S CORNER EASTERLY TO ROUTE 12, INCLUDES REHAB OF C-06-023 & REPLACEMENT OF O-06-002	3	NHPP	$7,956,218	$6,364,974	$1,591,244	Construction, Total Project Cost = $78,222,752, Project is AC'd between 2022 and 2025, PM Score = 22, Design Status = Advertised
Roadway Reconstruction										
2025	602659	Central Mass	Multiple	CHARLTON- OXFORD- RECONSTRUCTION ON ROUTE 20, FROM RICHARDSON'S CORNER EASTERLY TO ROUTE 12, INCLUDES REHAB OF C-06-023 & REPLACEMENT OF O-06-002	3	CMAQ	$176,050	$140,840	$35,210	Construction, Total Project Cost = $78,222,752, Project is AC'd between 2022 and 2025, PM Score = 22, Design Status = Advertised
Intersection Improvements							$9,754,231	$7,903,385	$1,850,846	
2025	608433	Central Mass	Webster	WEBSTER- INTERSECTION IMPROVEMENTS AT I-395 RAMPS (EXIT 2) AT ROUTE 16 (EAST MAIN STREET) AND SUTTON ROAD	3	STBG	$3,273,663	$2,618,930	$654,733	Construction, STBG + Statewide HSIP Total Project Cost = $7,593,663, Design Status = 25%, PM Score = 17, YOE = 8%
2025	608433	Central Mass	Webster	WEBSTER- INTERSECTION IMPROVEMENTS AT I-395 RAMPS (EXIT 2) AT ROUTE 16 (EAST MAIN STREET) AND SUTTON ROAD	3	HSIP	$4,320,000	$3,888,000	$432,000	Construction, STBG + Statewide HSIP Total Project Cost = $7,593,663, Design Status = 25%, PM Score = 17, YOE = 8%

Table 3

Central Mass Region TIP Projects (2023-2027)

STIP: 2023 - 2027 (D)

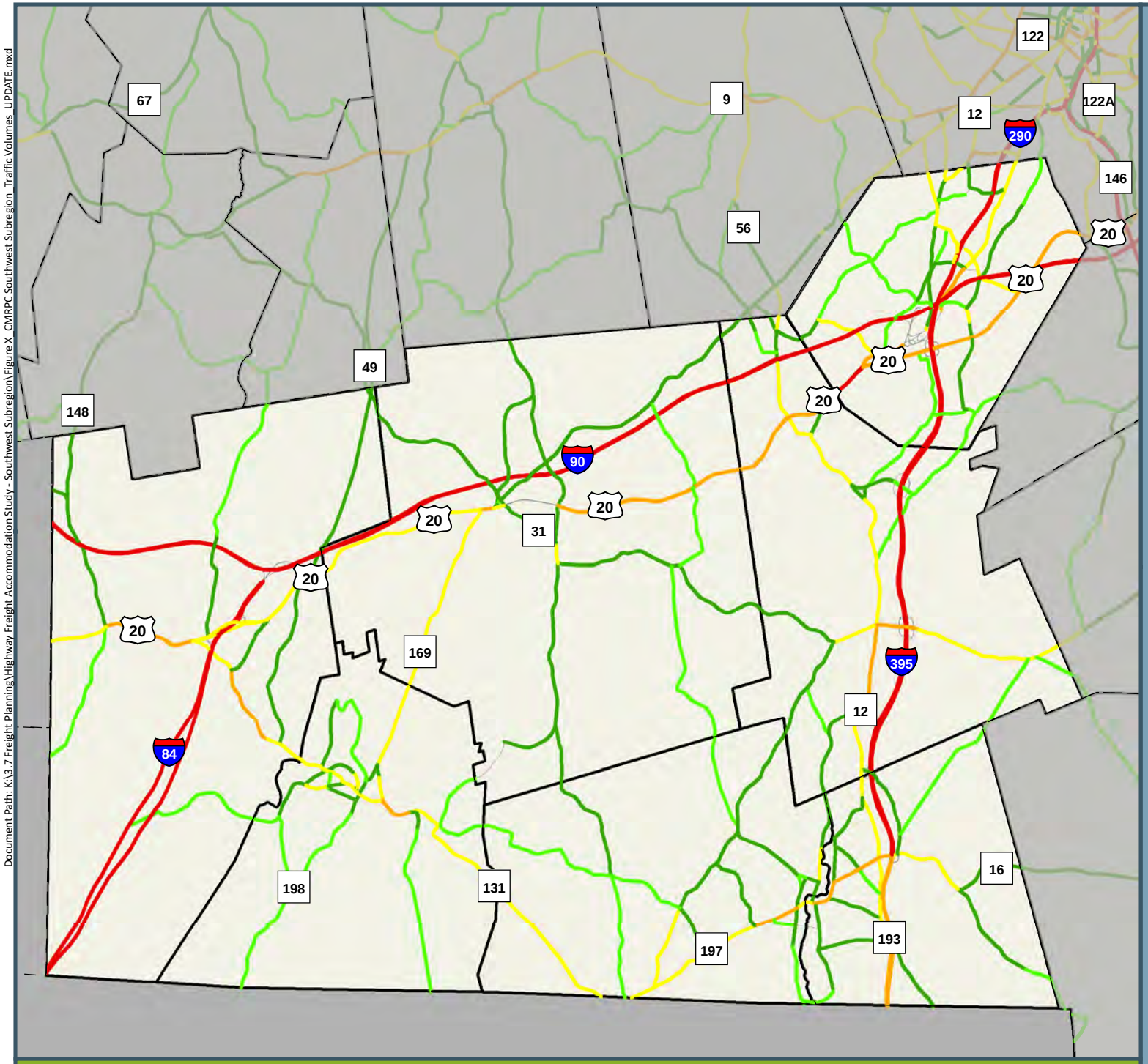
Year	MassDOT Project ID	MPO	Municipality	MassDOT Project Description	District	Funding Source	Total Programmed Funds	Federal Funds	Non-Federal Funds	Other Information
Bridge On-system NHS										
2025	612192	Central Mass	Auburn	AUBURN- BRIDGE REPLACEMENT, A-17-038, US 20 (WB) WASHINGTON STREET OVER I-395	3	NGBP	$13,529,400	$0	$13,529,400	Construction, Total Project Cost = $13,529,400, Design Status = Approved, YOE = 8%
Roadway Reconstruction										
2026	611933	Central Mass	Sturbridge	STURBRIDGE- ROUNDABOUT CONSTRUCTION AT THE INTERSECTION OF ROUTE 20 AND ROUTE 131	3	STBG	$7,172,592	$5,738,074	$1,434,518	Construction, Total Project Cost = $7,172,592, Design Status = Approved, PM Score = 15, YOE = 12%
2026	S12206	Central Mass	Sturbridge	STURBRIDGE - IMPROVEMENTS AT BURGESS ELEMENTARY SCHOOL (SRTS)	3	TAP	$678,199	$542,559	$135,640	SRTS infrastructure project awarded in 2022. To be updated with project ID once approved by PRC. 12% inflation applied for FFY 2026.
Interstate Pavement										
2026	612095	Central Mass	Oxford	OXFORD- INTERSTATE MAINTENANCE AND RELATED WORK ON I-395	3	NHPP-I	$10,690,400	$9,621,360	$1,069,040	Construction, Total Project Cost = $10,690,400, Design Status = Approved, YOE = 12%
Bridge On-system NHS										
2026	612181	Central Mass	Charlton	CHARLTON- BRIDGE REPLACEMENT, C-06-019, US 20 STURBRIDGE ROAD OVER CADY BROOK	3	NHPP	$4,247,994	$3,398,395	$849,599	Construction, Total Project Cost = $4,247,994, Design Status = Approved, YOE = 12%
Bridge On-system Non-NHS										
2026	612191	Central Mass	Auburn	AUBURN- BRIDGE REPLACEMENT, A-17-003, OXFORD STREET OVER KETTLE BROOK	3	NGBP	$16,496,137	$0	$16,496,137	Construction, Total Project Cost = $16,496,137, Design Status = Approved, YOE = 12%
Safety Improvements										
2027	611967	Central Mass	Multiple	STURBRIDGE- CHARLTON- INTERSECTION IMPROVEMENTS ON ROUTE 49 AT PUTNAM ROAD, WALKER POND ROAD & ROUTE 20	3	HSIP	$4,205,000	$3,784,500	$420,500	Construction, Total Project Cost = $4,205,000, Design Status = Approved, YOE = 16%
Non-Interstate Pavement										
2027	612089	Central Mass	Southbridge	SOUTHBRIDGE- DUDLEY- RESURFACING AND RELATED WORK ON ROUTE 131	3	NHPP	$5,568,000	$4,454,400	$1,113,600	Construction, Total Project Cost = $5,568,000, Design Status = Approved, YOE = 16%
Bridge On-system Non-NHS										
2027	605323	Central Mass	Oxford	OXFORD- BRIDGE REPLACEMENT, O-06-030, (ST 56) LEICESTER ROAD OVER THE FRENCH RIVER	3	NGBP	$1,740,000	$0	$1,740,000	Construction, Total Project Cost = $1,740,000, Design Status = Approved, YOE = 16%

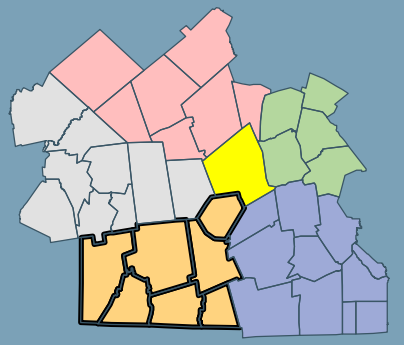
2.3 Traffic Volumes & Truck Percentages

CMRPC conducts mechanical traffic counts on numerous federal-aid highways within the Central Massachusetts planning region. The Automatic Traffic Recorders (ATRs) can collect volume data as well as vehicle classification data. Classification data is separated into 13 categories, established by FHWA, in which more than half of the categories can be considered a heavy vehicle. Heavy vehicle data is only available from 2016 to the present. As such, some of the federal-aid highways monitored by the planning staff have no vehicle classification data at this time. The most current 24-hour traffic volume data available for the federal-aid highways in the Southwest subregion are shown on the following maps.

Figure 6 shows the traffic volumes on the federal-aid highways within the Southwest subregion. Most major roadways consist of volumes below 7,500 vehicles per day (VPD) while the state routes are mainly above 7,500 VPD. All four Interstate roads (84, 90, 290 & 395) in the Southwest subregion carry more than 30,000 VPD. The majority of US Route 20 and portions of Route 12, Route 131, and Route 197 accommodate in excess of 15,000 VPD.

Figure 7 shows heavy vehicle volumes based on the thickness of the red line. The thicker the line, the higher the observed heavy vehicle volumes. As the map shows there are a number of highways where heavy vehicle volume data is not available at this time. The roadways exceeding 1,000 heavy VPD are Routes 20 & 49 in Sturbridge, a portion of Route 131 in Southbridge, and Route 12 & Oxford Street North in Auburn. Similar to the previous figure, **Figures 8 and 9** also show heavy vehicle volumes by direction of travel. The first map shows daily heavy vehicle volumes for the northbound and eastbound directions. The second map shows daily heavy vehicle volumes for the southbound and westbound directions. As can be seen, the heavy vehicle volumes are color-coded in four categories corresponding to the volume totals. In addition to volumes, **Figure 10** shows heavy vehicle volume percentages in the Southwest subregion. Observed percentages are also separated into four categories, with the color red being the highest (>14%). Most highways where vehicle classification data is available range between 5% and 14% heavy vehicles. The only segment exceeding 14% is on Route 12 in the town of Auburn, between Auburn Street and the Worcester City Line.





Legend

- Southwest Subregion Towns
- < 2,500
- 2,500 - 7,499
- 7,499 - 14.999
- 14,999 - 30,000
- > 30,000

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FIGURE 6 - SOUTHWEST SUBREGION TRAFFIC VOLUMES

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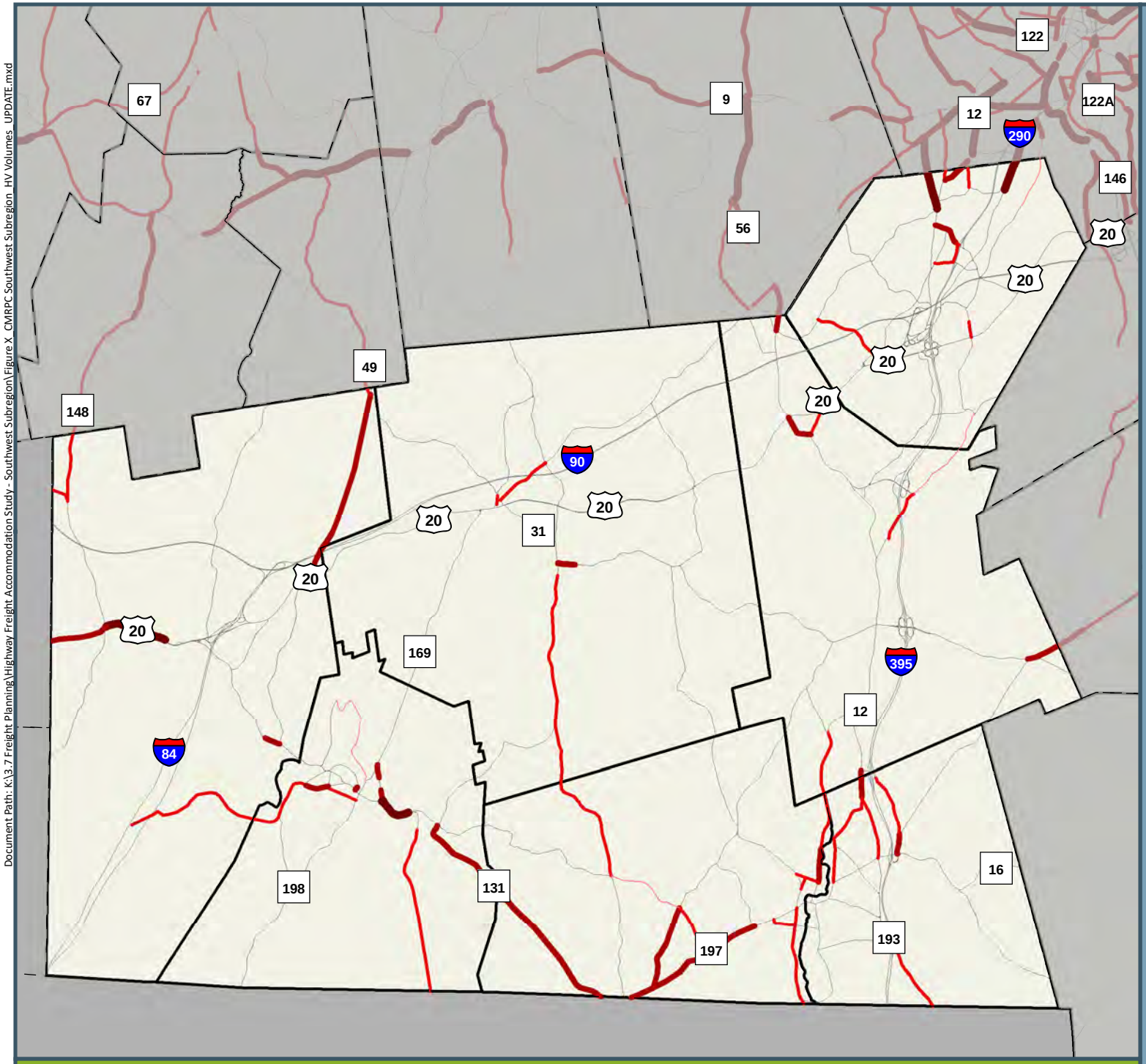

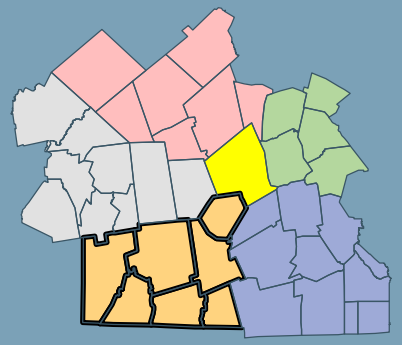

Legend

- Southwest Subregion Towns
- 1 - 100
- 101 - 500
- 501 - 1,000
- > 1,000
- No Data

N

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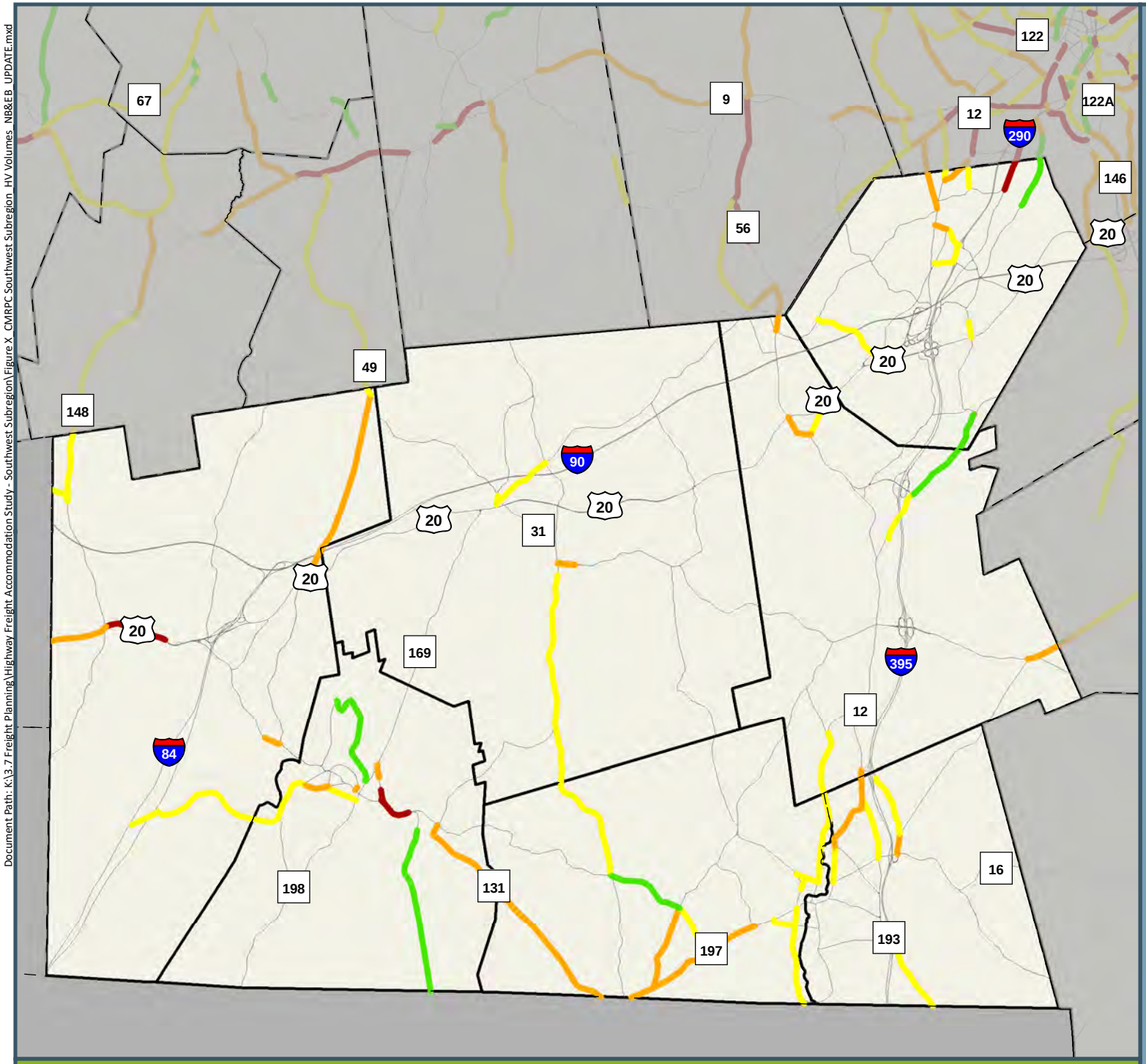
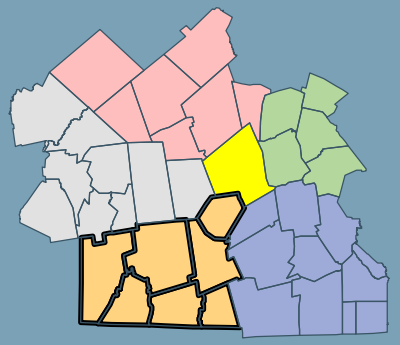
Document Path: K:\3.7 Freight Planning\Highway Freight Accommodation Study - Southwest Subregion\Figure X_CMRPC Southwest Subregion_HV Volumes_UPDATE.mxd

FIGURE 7 - SOUTHWEST SUBREGION HEAVY VEHICLE VOLUMES





Legend

- Southwest Subregion Towns
- 0 - 50
- 51 - 250
- 251 - 500
- > 500
- No Data

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FIGURE 8 - SOUTHWEST SUBREGION HEAVY VEHICLE VOLUMES, NB/EB

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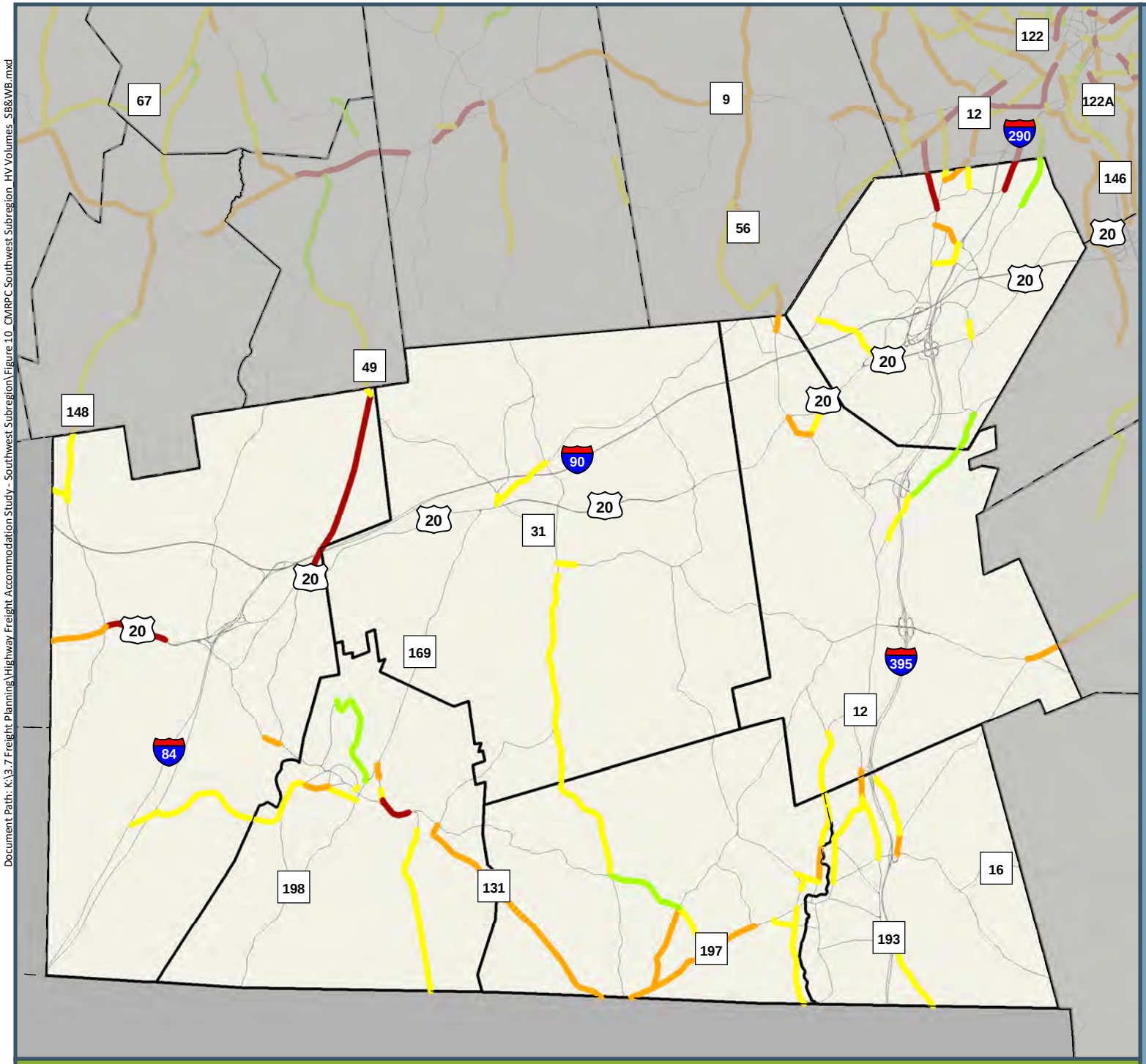

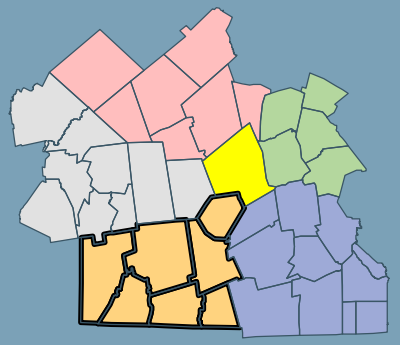

Legend

- Southwest Subregion Towns
- 0 - 50
- 51 - 250
- 250 - 500
- > 500
- No Data

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Source: Data provided by the Central Massachusetts Regional Planning Commission (CMRPC), MassDOT/ Office of Geographic Information (MassGIS), Massachusetts Department of Environmental Protection

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FIGURE 9 - SOUTHWEST SUBREGION HEAVY VEHICLE VOLUMES, SB/WB

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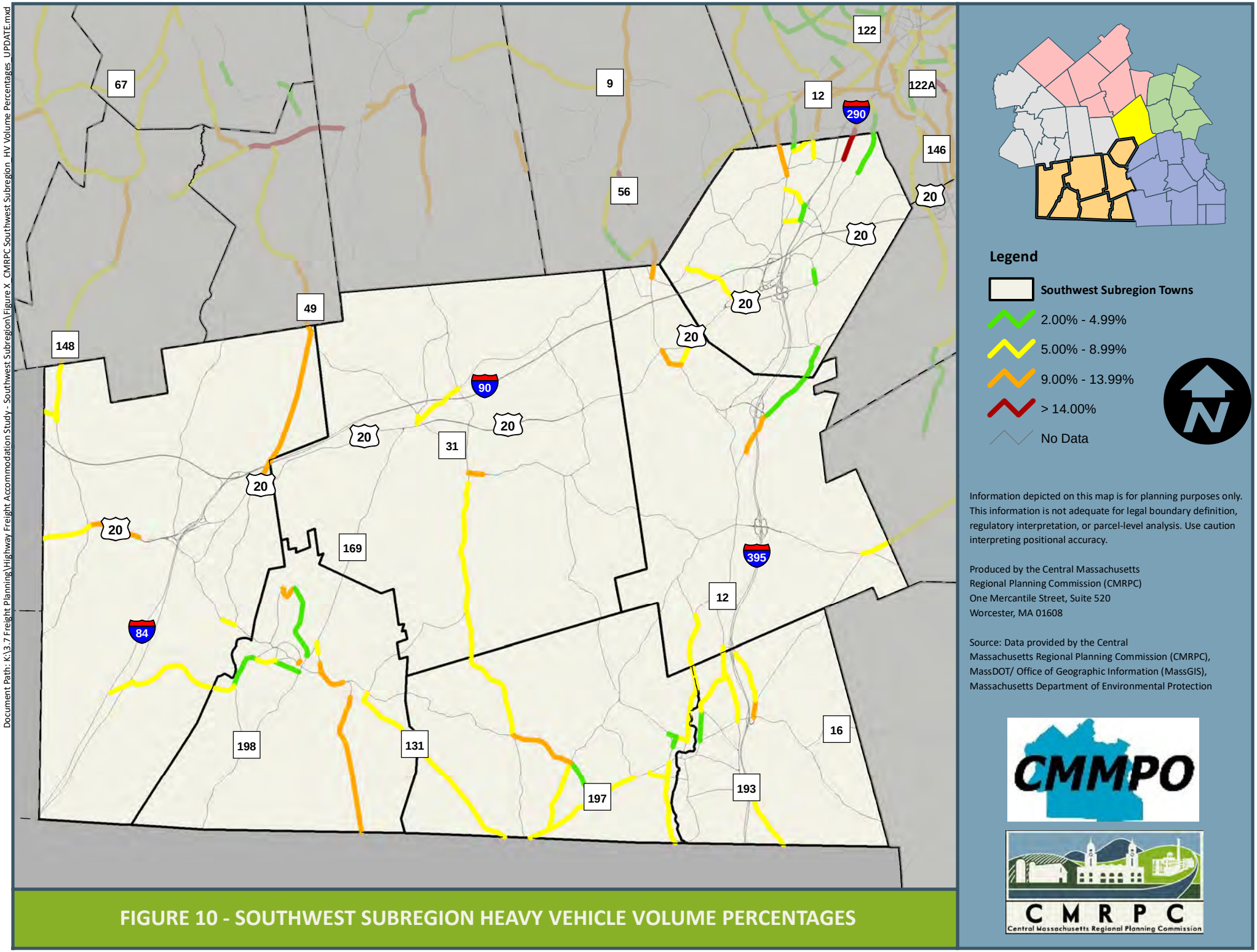


FIGURE 10 - SOUTHWEST SUBREGION HEAVY VEHICLE VOLUME PERCENTAGES

3.0 Host Community Management Systems Information

This section discusses the Management Systems data & analyses that is used for this study. Management Systems data includes congestion data such as highway travel speeds and intersection delays, safety data, pavement condition, traffic volumes and bridge conditions. These types of data are each considered separately but are also analyzed together within a data integration exercise, summarized at the end of this section. Knowing the specific highway segments that have multiple identified deficiencies greatly assists in the decision-making process concerning which to potentially improve first while also simultaneously addressing a range of identified issues.

3.1 Congestion Management Process (CMP)

A CMP is an accepted, systematic approach for managing network congestion that provides accurate and current information on transportation system performance and assesses alternate strategies for congestion management that meet both state and local needs. As defined in federal regulation, a planning region's CMP should provide for the safe and effective integrated management and operation of the multimodal transportation system. There are eight (8) recommended actions taken within a CMP, as follows:

1) Develop regional objectives
2) Define the CMP network
3) Develop multimodal performance measures
4) Monitor and collect data
5) Analyze congestion problems and needs
6) Identify and assess strategies
7) Program and implement strategies, and
8) Evaluate strategy effectiveness

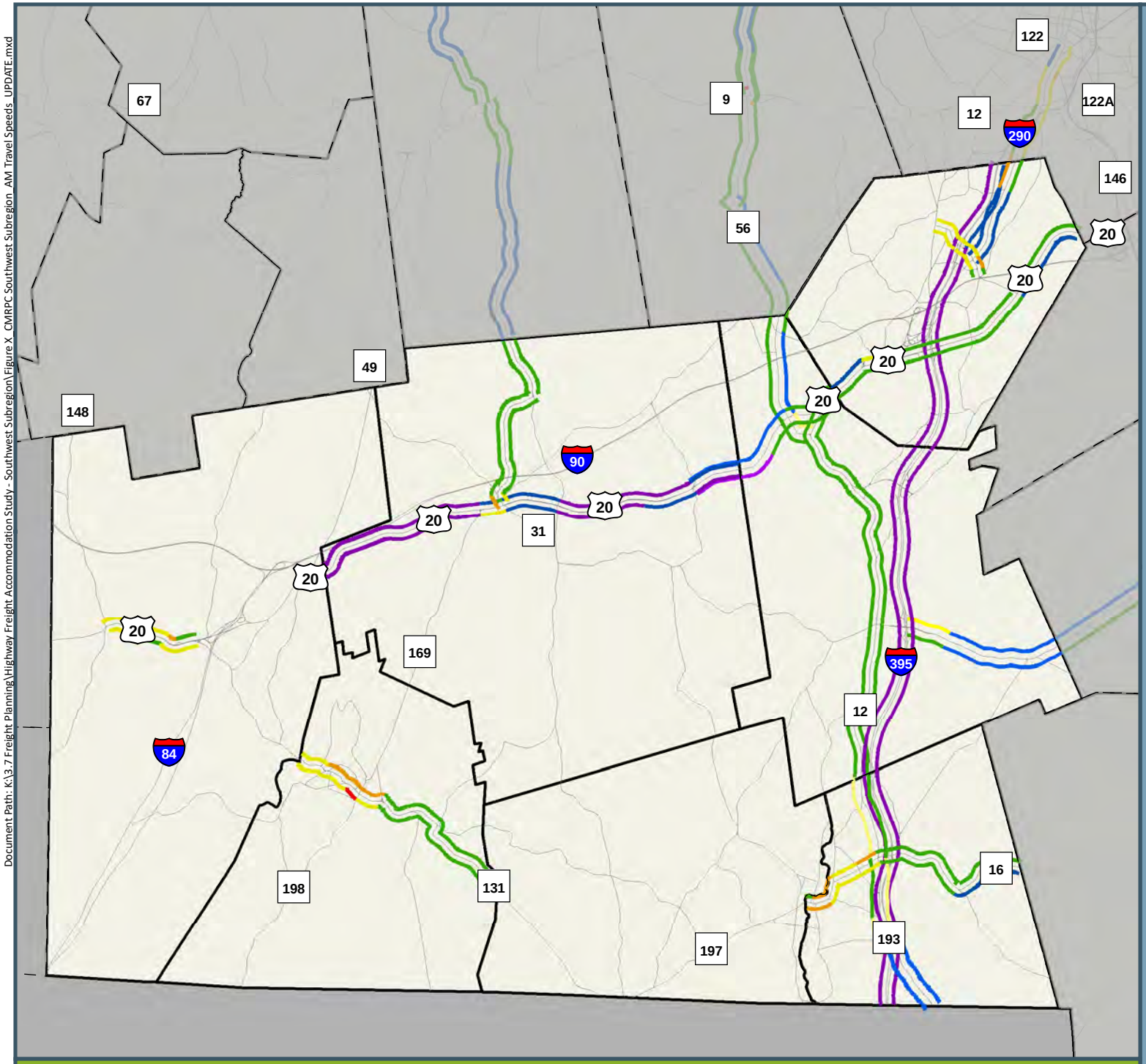
The CMP data included in this section are from both Travel Time & Delay studies and Turning Movement Counts (TMCs) conducted in the field.

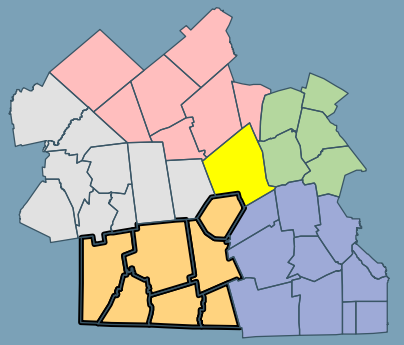
Roadway Segment Travel Speeds

In order to measure congestion on the planning region's highway facilities, Travel Time & Delay studies are periodically conducted on identified CMP focus roadway segments. Data is collected between 7:00 AM and 9:00 AM and from 4:00 PM to 6:00 PM on a single randomly selected weekday. In addition to determining average highway travel speeds, Travel Time &

Delay studies on a particular roadway segment assist in the identification of critical vehicle delay locations as well as length of encountered delays. The “average car” technique is used to collect this data. In this procedure to collect the needed data, a test vehicle travels according to the driver’s judgement of the average speed of existing traffic flows. A Global Positioning System (GPS) device allows for the automated collection of the travel time data.

The following two maps, **Figures 11 and 12**, show average travel speeds for the Southwest subregion in the AM and PM peak hours. Travel speeds are separated into six (6) categories and have been assigned different colors. The observed travel speeds are shown for both directions. Travel time data was available for all the host communities except the town of Dudley. Travel speed data was available for segments of Routes 12, 16, US 20, 31, 56, 131, and 193. Additionally, Interstates 290 and 395 also had travel speed data available. As shown in both maps, there is a mixture of travels speeds during both the AM and PM peak periods.





Legend

- Southwest Subregion Towns
- < 10 mph
- 10 - 19 mph
- 20 - 29 mph
- 30 - 39 mph
- 40 - 49 mph
- > 49 mph

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Document Path: K:\3.7 Freight Planning\Highway Freight Accommodation Study - Southwest Subregion\Figure X_CMRPC Southwest Subregion_AM Travel Speeds_UPDATE.mxd

FIGURE 11 - SOUTHWEST SUBREGION OBSERVED AM PEAK HOUR TRAVEL SPEEDS

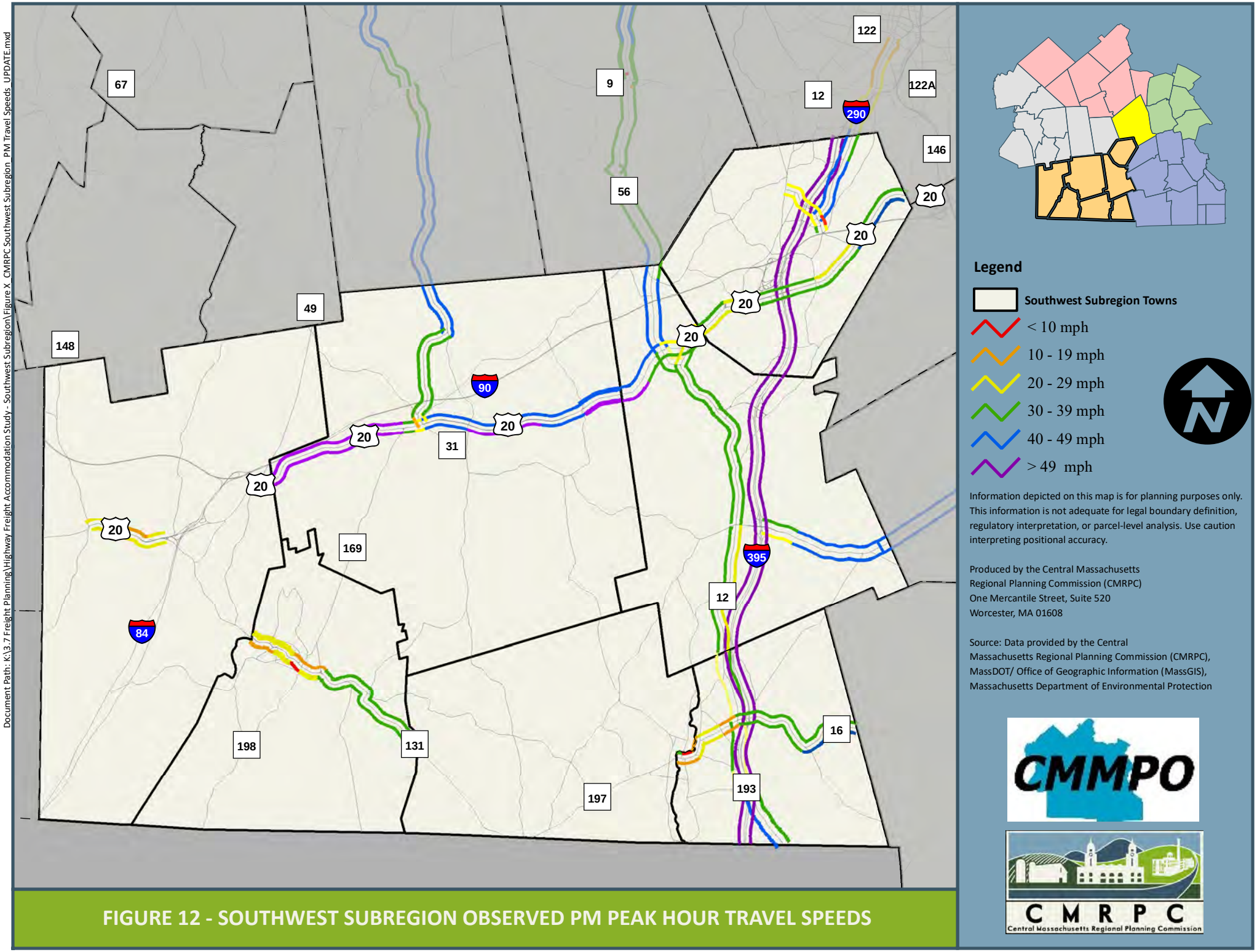


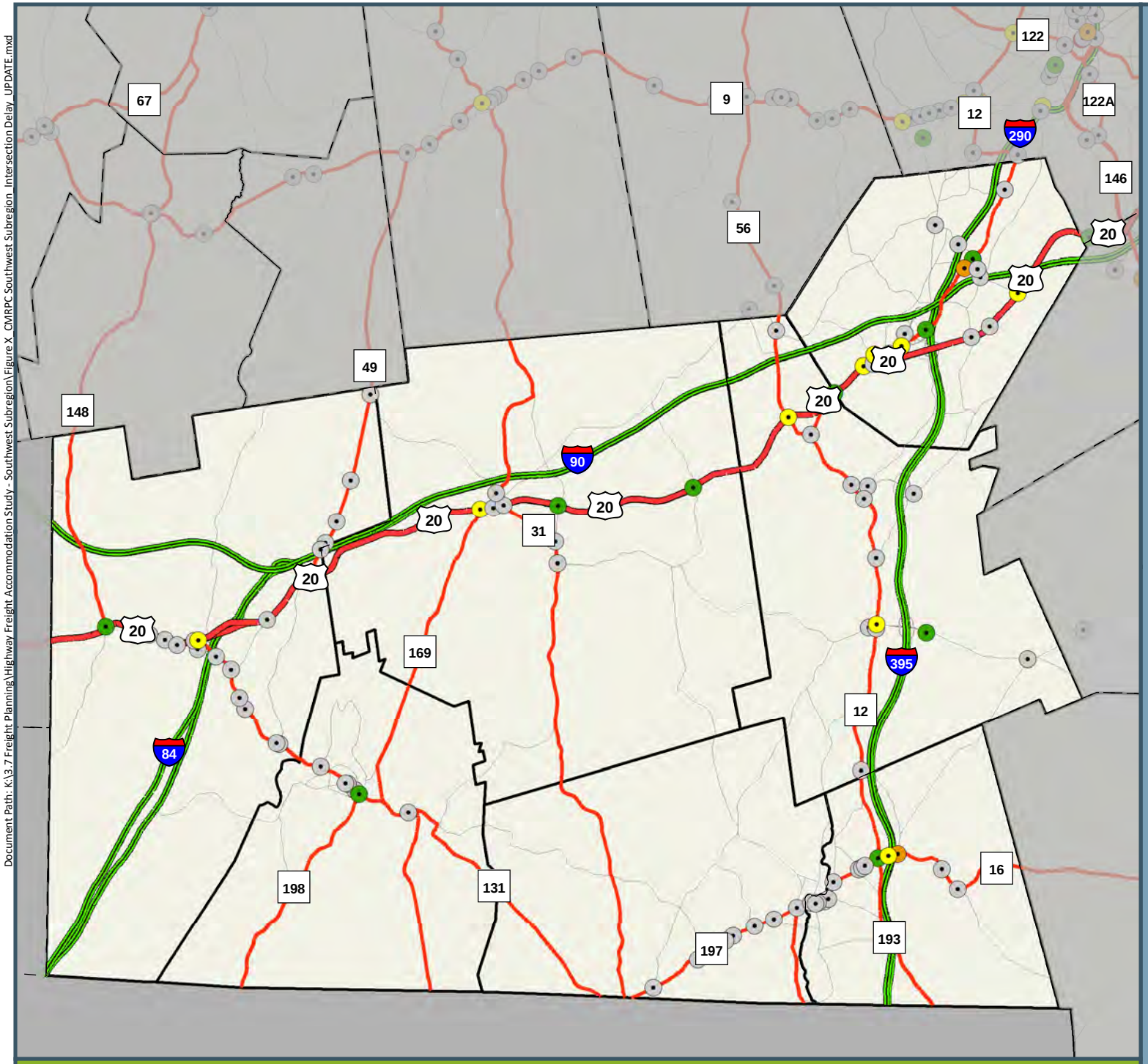
FIGURE 12 - SOUTHWEST SUBREGION OBSERVED PM PEAK HOUR TRAVEL SPEEDS

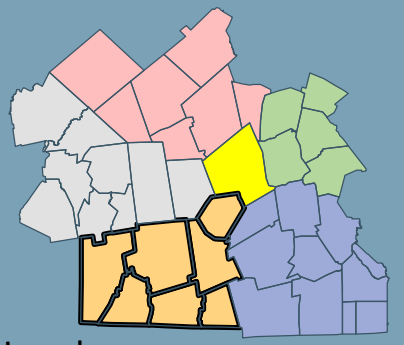
Intersection Encountered Delays

For all intersections where Turning Movement Counts (TMCs) are obtained, it is possible to analyze the total delay encountered during the examined peak hour travel periods. A byproduct of the process that results in intersection Level-of-Service (LOS) rankings is the "average delay encountered per entering vehicles". When multiplied by the number of vehicles to which the particular delay pertains, one can arrive at a total amount of delay, or time in "car-minutes". A car-minute is one car waiting for one minute, presumably idling and producing emissions as well as adding to total social and economic costs. Five cars waiting for a minute each, or one car waiting for a total of five minutes, results in the same theoretical total waiting time cost and would be measured and quantified by a total net delay of five car-minutes.

Signalized intersections have calculated delays of varying levels on all approaches. "STOP" sign-controlled intersections have delay calculated only for those vehicles arriving on the minor approaches that are required to stop as well as those vehicles on the major approaches waiting in order to make a left turn. Generally, signalized intersections often exhibit more total delay, however, a busy stop-controlled location (that may not presently meet the warrants for signalization) can exhibit substantial delays if volumes on both minor approaches predominately seek to cross the major approaches. Traffic signals establish orderly traffic flows and increase safety by providing the opportunity for traffic volumes to proceed on both the major and minor intersection approaches, thus balancing encountered vehicle delay. When two heavily traveled streets cross at a major signalized intersection, significant delays are often generated due to the high traffic volumes that need to be accommodated. Once intersection traffic signal operations are optimized, geometric improvements could potentially be considered, such as the addition of exclusive and/or shared turning lanes.

All seven (7) of the Southwest subregion communities have at least one critical intersection that was analyzed. Data has been collected for these intersections from 2010 to the present. If a location was counted multiple years, then the most recent data was used. **Figure 13** shows the Southwest subregion's identified critical intersections in five categories. Most of the intersections are within the lowest category, which have less than 1,525 "car-minutes" of total delay. There are multiple intersections that have more than 2,500 car-minutes of delay. These intersections are within the towns of Auburn, Charlton, Oxford, Sturbridge, and Webster. Additionally, there are two intersections in the Southwest subregion that have over 7,500 car-minutes of delay, one each in the towns of Auburn and Webster.





Legend

Southwest Subregion Towns

TotalDelay in Minutes

- 7 - 1,525
- 1,525 - 2,500
- 2,500 - 7,500
- 7,500 - 10,000
- > 10,000

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FIGURE 13 - SOUTHWEST SUBREGION ENCOUNTERED DELAY AT CRITICAL INTERSECTIONS

3.2 Safety Management System (SMS)

Vehicle crash data is provided by MassDOT through their web-based crash report tool "IMPACT". MassDOT's Registry of Motor Vehicles (RMV) branch provides the crash records incorporated into the IMPACT website. Notably, a quality control analysis is conducted on all crash records. Besides individual crashes, "crash clusters" that are indicative of numerous reported incidents are also identified for vehicles, bicycles and pedestrians.

Highway Safety Improvement Program (HSIP) Locations

The purpose of FHWA's HSIP is to reduce the number of fatal and serious injury vehicle crashes by targeting high vehicle crash locations and causes on all public roads. Projects using HSIP funding are required to be data-driven, strategic approaches to improving highway safety that focus on system performance. An overarching requirement is that federal-aid HSIP funds must be used for safety projects that are consistent with MassDOT's established Strategic Highway Safety Plan (SHSP). Such projects are meant to address identified highway safety problems by correcting or improving a hazardous roadway location or feature.

An HSIP-eligible crash cluster is one in which the total number of Equivalent Property Damage Only (EPDO) crashes are within the top 5% in the planning region. The EPDO is a method of combining the number of crashes along with the severity of those crashes based on a weighted scale. Prior to 2016, the weighting factors used were as follows: a fatal crash was worth 10, an injury crash was worth 5 and a property damage-only crash was worth 1. Beginning in 2016, the weighting factors were updated so that fatal and injury crashes are now both worth 21 while a property damage-only crash continues to be worth 1.

As shown in **Figure 14**, there are 17 identified HSIP crash clusters in the Southwest subregion between 2017 - 2019. There are crash clusters located in six (6) of the Southwest towns. Charlton and Sturbridge have the most HSIP eligible locations, each with a total of five (5). Of the 17 HSIP locations, 16 are located on State Numbered Routes. The HSIP cluster with the most crashes is the area of the Route 31 & Stafford Street intersection in Charlton, with a total of 33 reported incidents.

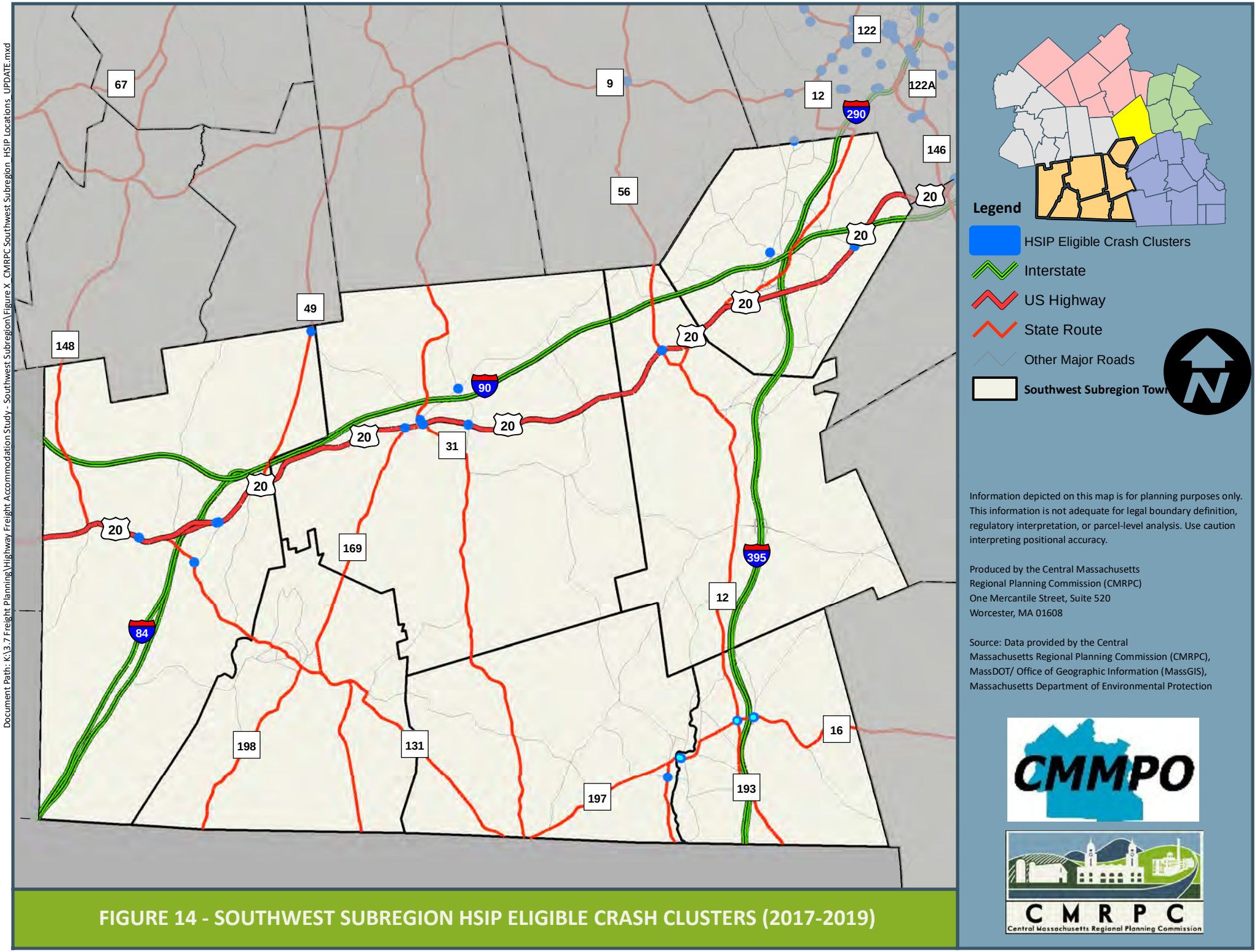


FIGURE 14 - SOUTHWEST SUBREGION HSIP ELIGIBLE CRASH CLUSTERS (2017-2019)

3.3 Pavement Management System (PMS)

Pavement management is an asset management system designed to assist decision-makers in determining the most cost-effective strategies to address poor or failing roadway conditions. In general, a successful PMS defines a roadway network, identifies the condition of each segment of the network, develops a list of needed improvements, and balances those needs with the available resources of the party responsible (local, state or federal) for maintaining the defined roadway network. CMRPC uses *Cartegraph*, a software package developed and supported by Cartegraph Systems Incorporated, for the CMMPO's ongoing pavement management program to assess overall pavement condition in the planning region.

Pavement data has been collected on all federal-aid eligible roadways by conducting "windshield surveys." A team of two CMRPC representatives inspect each roadway segment, taking note of the severity and extent of the following pavement distresses:

- Potholes
- Distortions
- Alligator Cracking
- Transverse and Longitudinal Cracking
- Block Cracking
- Rutting
- Bleeding/Polished Aggregate
- Surface Wear and Raveling
- Corrugations, Shoving, and Slippage

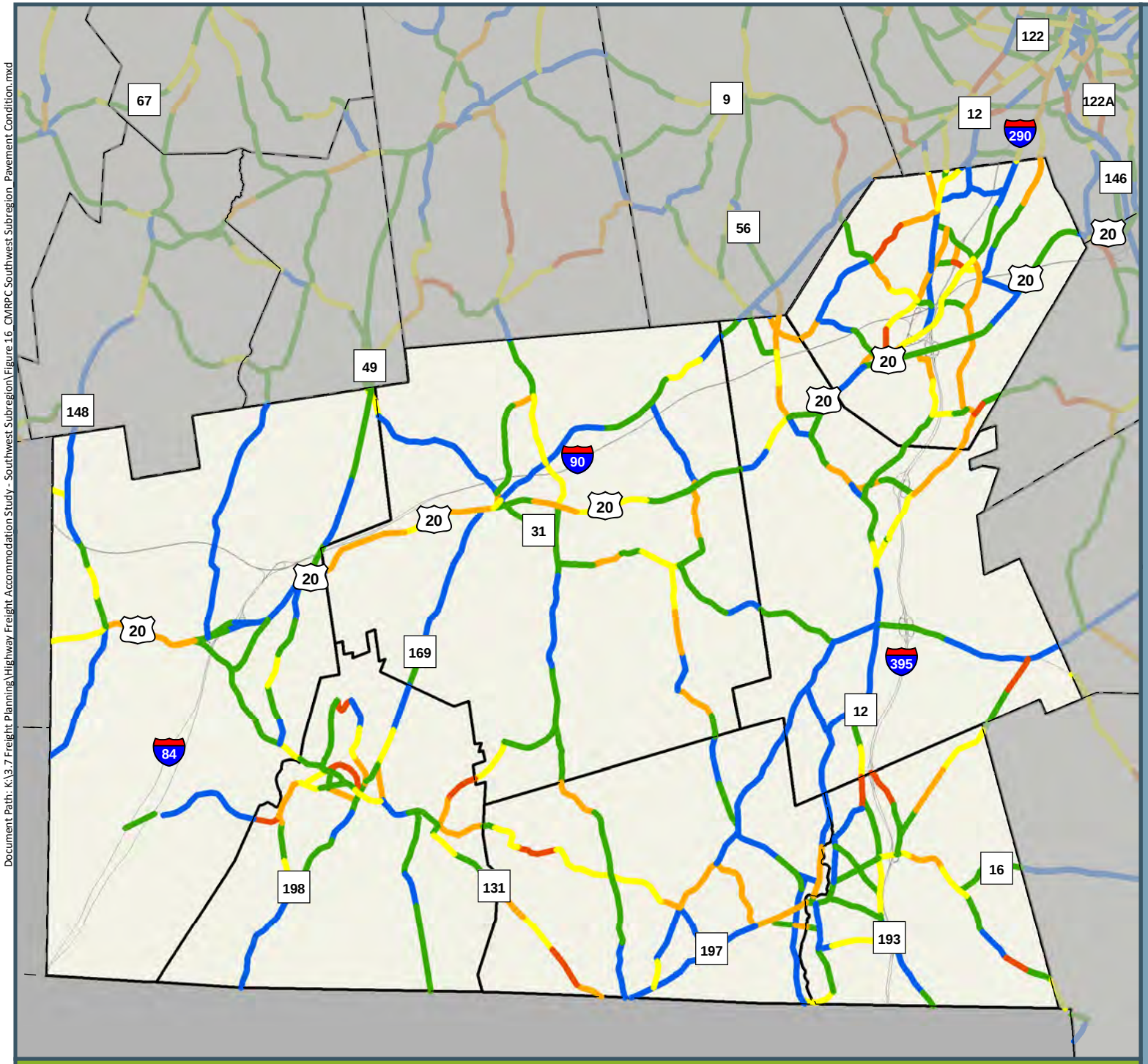
Based on the field-observed pavement distresses, an Overall Condition Index (OCI) was calculated for each surveyed roadway segment. The OCI is used to rate each segment on a scale of 0 to 100. An OCI of 100 indicates optimal pavement conditions, usually a newly paved roadway segment. Conversely, a score of 0 indicates that a roadway has failed entirely and is likely impassable for an average passenger vehicle. Starting at the top index rating of 100, the OCI is calculated by subtracting a series of deduct values, each associated with the severity and extent of the various pavement distresses listed above. The resulting OCI is a quantified rating of observed pavement condition.

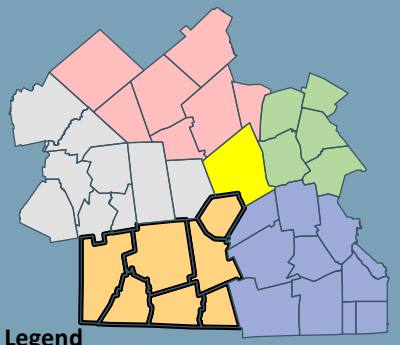
Depending on the OCI score, *Cartegraph's* recommended action category definitions are as follows:

- Do Nothing (OCI 100 – 88) – used when a road is in relatively perfect condition and prescribes no maintenance.

- Routine Maintenance (OCI 88 – 68, good condition) – 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, localized repair, or minor localized leveling.
- Preventative Maintenance (OCI 68 – 48) – used on roads in fair condition that have a 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.
- Structural Improvement (OCI 48 – 24) – used on poor roads 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 planning and overlay, and hot in-place recycling.
- Base Rehabilitation (OCI 24 – 0) – used for very poor roads that exhibit weakened pavement foundation base layers. Complete reconstruction and full-depth reclamation are indicated.

Figure 15 shows the observed pavement condition on the federal-aid highways in the Southwest subregion. As shown on the map, all roadways have been analyzed except for Interstates, which is the exclusive responsibility of MassDOT. All the communities in the Southwest planning subregion have roadway segments observed to be in both “poor” or “very poor” condition. Overall, however, most roadways in the Southwest subregion were determined to be in “fair” condition or better.





Legend

- Very Poor
- Poor
- Fair
- Good
- Excellent
- No Data
- **Southwest Subregion Towns**

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FIGURE 15 - SOUTHWEST SUBREGION PAVEMENT CONDITION

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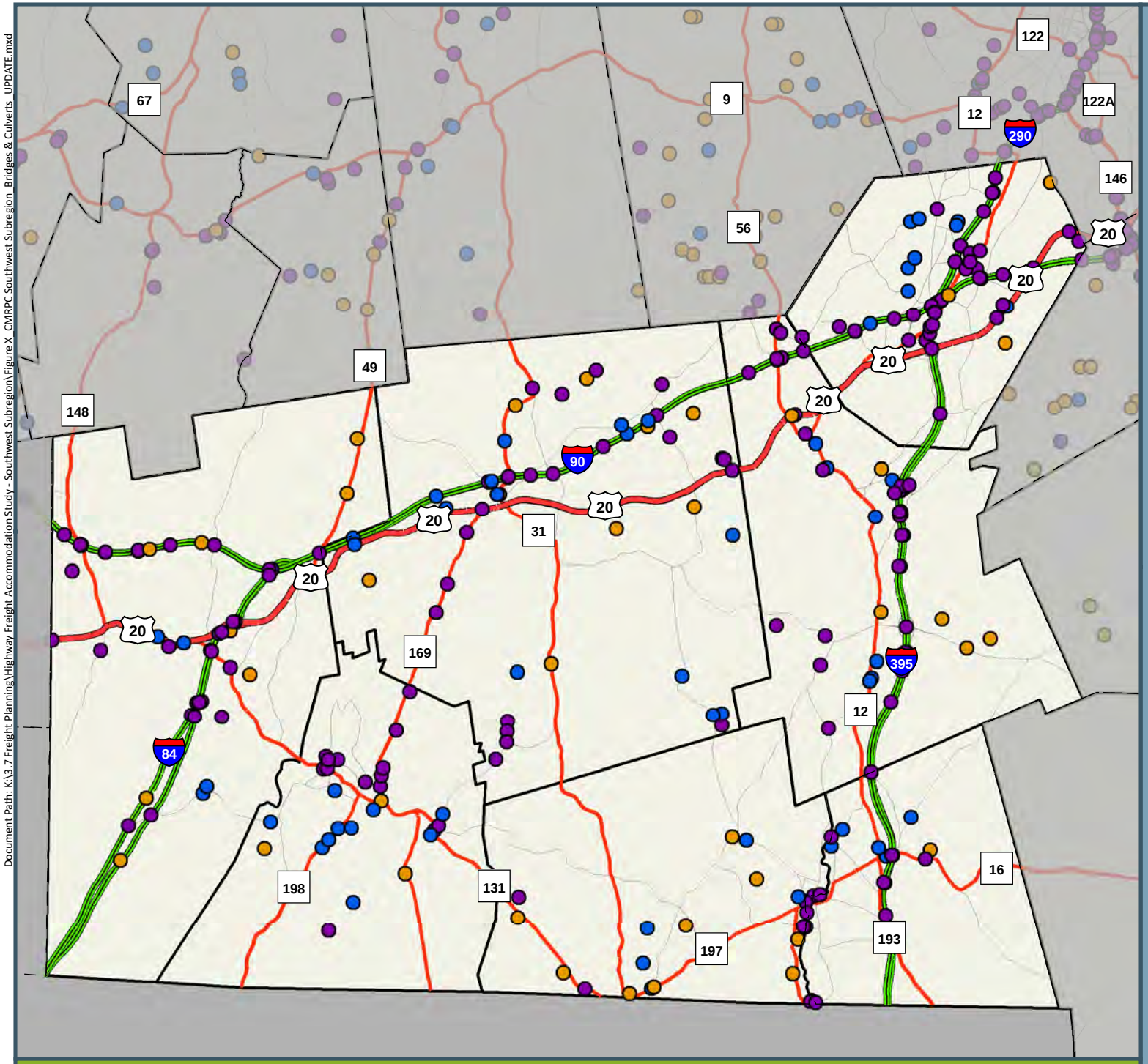
3.4 Bridge Management System (BMS) and Culverts

Figure 16 contains bridge data from the MassDOT – Highway Division Bridge Inspection Management System (BIMS). The types of structures included in the BIMS are:

- MassDOT Highway and municipally owned structures with spans greater than 20 feet. These are categorized as National Bridge Inventory (NBI) structures. MassDOT inspects NBI bridges on a biannual basis.
- MassDOT Highway and municipally owned short span bridges with spans between 10 and 20 feet. *The first complete inspection of the short span bridge inventory is currently in progress.*
- MassDOT Highway and municipally owned culverts with spans of 4 to 10 feet. *This category is currently incomplete and an inventory effort is now underway.*

There are a total of 270 bridges and culverts in the Southwest planning subregion. 55 of the total bridges and culverts are on State Numbered Routes while 86 are on the Interstates. Additionally, there are 22 structures that are considered Structurally Deficient and nine (9) are on State Numbered Routes. A Structurally Deficient bridge is defined as a bridge whose condition has been rated no better than poor in any of these five areas: bridge deck, superstructures, substructures, culverts, and retaining walls. The host community of Auburn has the most structures overall with a total of 58 – many on the Interstate System - while the host community of Sturbridge has the most structures on State Numbered Routes with a total of nine (9).



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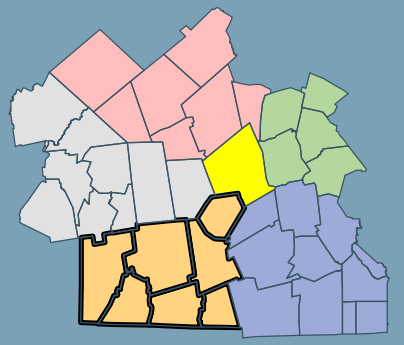

Legend

- Southwest Subregion Towns
- Bridge (NBI)
- Short Span Bridge
- Culvert
- Interstate
- US Highway
- State Route
- Other Major Roads

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FIGURE 16 - SOUTHWEST SUBREGION BRIDGES AND CULVERTS

3.5 Management Systems Data Integration

Potential priorities for the Southwest planning subregion have been screened using a Management Systems approach, resulting in the identification of several highway segments that demonstrate the greatest need for improvement. The highway segments used in the integration analyses are based on staff's previously defined pavement data collection segments. These segments are usually less than one-mile in length and are between two selected minor streets. All available data were analyzed based on these defined segments. The Management Systems integration approach combines the data related to congestion, safety, traffic volume, pavement condition, freight movement, intersection delays, and bridges to define "hot spots" within the Southwest subregion. The Management Systems data was analyzed to create corresponding scores based on pre-determined criteria. **Table 4** shows the scoring method used for the highway segments.

Table 4 – Management Systems Analysis Scoring Criteria

Management System	Type of Data Used	Scoring Criteria	Points
Congestion	CMRPC Travel Demand Model	Segment is Congested	5 points
		Segment is not Congested	0 points
Safety	MassDOT Crash Data (2017-2019)	Segment has a Fatality	5 points
		Segment has an Injury	3 points
		Segment has a Property Damage-Only Crash	1 point
Traffic Volume	CMRPC Traffic Count Data	>20,000 VPD	5 points
		10,000 – 20,000 VPD	3 points
		<10,000 VPD	1 point
Pavement Condition	CMRPC Pavement Data	Segment is rated Very Poor	5 points
		Segment is rated Poor	3 points
		Segment is rated Fair	1 point
Freight	CMRPC Traffic Count Data	>1,000 Heavy Vehicles Per Day	5 points
		500 – 1,000 Heavy Vehicles Per Day	3 points
Freight Routes	Critical Freight Corridors	Segment is a Defined Critical Freight Corridor	3 points
Intersection Delays	CMRPC TMC Data	>7,500 Minutes of Total Delay	5 points
		1,525 – 7,500 Minutes of Total Delay	3 points

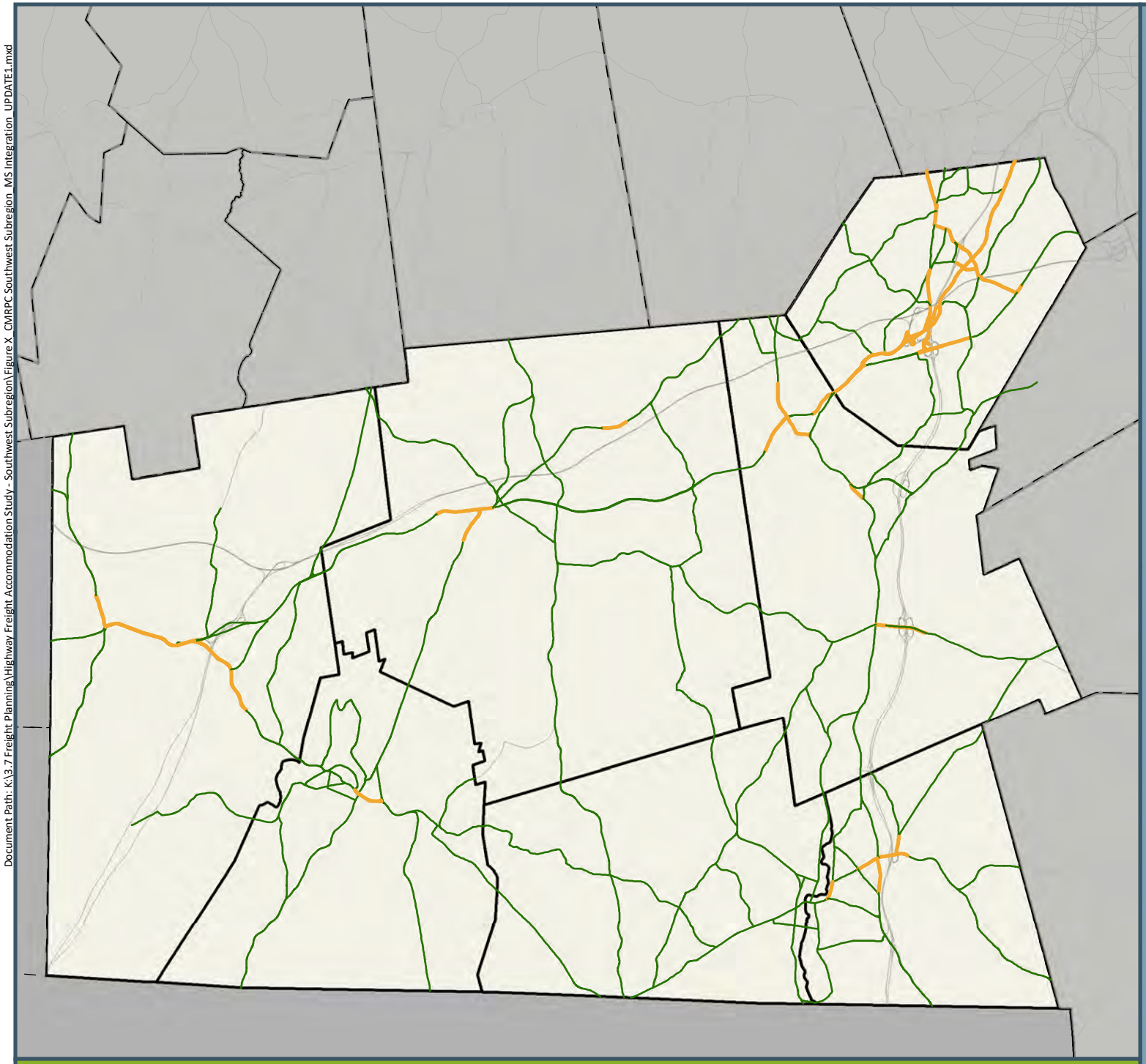
Management System	Type of Data Used	Scoring Criteria	Points
		<1,525 Minutes of Total Delay	1 point
Bridges	MassDOT Bridge Data	Segment has a Structurally Deficient or Weight-Restricted Posted Bridge	3 points

Based on the above scoring criteria, **Figure 17** shows the highway segment Management System integration results in three (3) categories. Tier 1 segments are considered "high priority", Tier 2 segments are considered "medium priority", and Tier 3 segments are "low priority". As the map shows, there are no identified Tier 1 highway segments in the Southwest subregion. Corresponding to the map, Tier 2 roadway segments scores are listed in **Table 5**. While there are no Tier 1 segments, there are a total of 36 Tier 2 highway segments that have been identified in the Southwest planning subregion. 25 of the 36 Tier 2 highway segments are located on State Routes 12, 16, US 20, 56, 131, 148, 169, and 193. The town of Auburn has the most Tier 2 segments with a total of 16. The town of Dudley is the only community without a Tier 2 segment.

Table 5 – Management Systems Tier 2 Roadway Segments

Community	Roadway	From	To	Total Points
Sturbridge	Main St (20)	Cedar St	Brookfield Rd (148)	20
Auburn	Swanson Rd	Vine St	Bryn Mawr Ave	19
Auburn	Southbridge St (12)	Water St	Faith Ave	19
Webster	Sutton Rd	Gore Rd (16)	Cudworth Rd	18
Auburn	Southbridge St (12)	Eaton Ave	Auburn St	17
Auburn	Southbridge St (12)	Auburn St	Water St	17
Southbridge	Main St (131)	Hamilton St E	Rotary	17
Webster	Gore Rd (16)	Carousel Way	Thompson Rd (193)	17
Auburn	Southbridge St (12/20)	Washington St (20)	Oxford TL	16
Sturbridge	Brookfield Rd (148)	Main St (20)	Collette Rd N	16
Auburn	Auburn St	Pakachoag St	Southbridge St (12)	15
Auburn	Paul A. Brotherton Way	Auburn St	Southbridge St (12)	15
Auburn	Auburn St	Vine St	Oxford St North	15
Auburn	Southbridge St (12)	Worcester CL	Eaton Ave	15
Auburn	Southbridge St (12)	Faith Ave	Washington St (20)	15
Oxford	Leicester Rd (56)	Merriam Rd	Southbridge Rd (20)	15

Community	Roadway	From	To	Total Points
Oxford	Leicester Rd (56)	Southbridge Rd (20)	Main St (12)	15
Oxford	Southbridge Rd (20)	Leicester Rd (56)	Oxbow Rd	15
Oxford	Main St (12)	Front St	Quobaug Ave	15
Sturbridge	Main St (131)	Main St (20)	Hall Rd	15
Webster	East Main St (12)	Slater St	Worcester Rd (12)	15
Charlton	Southbridge Rd (169)	House #44	Sturbridge Rd (20)	15
Charlton	Sturbridge Rd (20)	Stafford St	Capen Rd	15
Auburn	Millbury St	Pakachoag St	Washington St (20)	14
Auburn	Auburn St	Southbridge St (12)	Vine St	14
Auburn	Auburn St	Vine St	Oxford St North	14
Oxford	Southbridge Rd (20)	Auburn TL	Turner Rd	14
Sturbridge	Main St (131)	Hall Rd	Shepard Rd	14
Webster	South Main St (12)	Lake St	East Main St (12)	14
Auburn	Pinehurst Ave	Worcester CL	Oxford St North	13
Auburn	Oxford St North	Bryn Mawr Ave	Southbridge St (12)	13
Auburn	Washington St (20)	South St	Oxford St South	13
Oxford	Main St (12)	Depot Rd	Old Worcester Rd	13
Sturbridge	Main St (20)	Cedar St	Southbridge Rd (20)	13
Webster	Thompson Rd (193)	East Main St (12)	Park Ave	13
Charlton	Stafford St	Little Muggett Rd	Cemetary Rd	13



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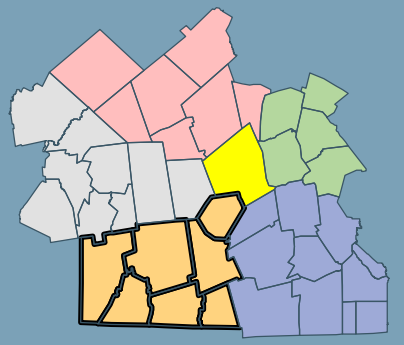

Legend

- Tier 3 = 1 - 12 points
- Tier 2 = 13 - 24 points
- Tier 1 = 25 - 36 points
- **Southwest Subregion Towns**

N

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FIGURE 17 - SOUTHWEST SUBREGION MANAGEMENT SYSTEMS DATA INTEGRATION

4.0 Other Major Considerations

This section of the *Southwest Subregion Highway Freight Accommodation Study* covers a range of other considerations that assist in the decision-making process of where to potentially apply future-year federal-aid improvement funding. Following federal Performance Management requirements, Truck Travel Time Reliability (TTTR) in the planning region is summarized and a comparison is made between statewide MassDOT TTTR targets and the conditions observed in the planning region. Next, a series of Environmental Consultation maps are provided concerning the critical natural features in the Southwest subregion. Findings extracted from the established Municipal Vulnerability Preparedness (MVP) programs for each host community are also reviewed. The trucking-centric findings of the regional Travel Demand Model, a computer simulation of the network of highways in the Southwest subregion, are then summarized. Both existing and future benchmark year truck volumes have been estimated by the Model, as well as potential future-year "bottleneck" highway segments.

4.1 Performance Management

Performance-Based Planning and Programming (PBPP) refers to a transportation agency's application of performance management in their ongoing planning and programming activities. The foundation of PBPP was initially federally-legislated through Moving Ahead for Progress in the 21st Century (MAP-21) and reaffirmed in the recent Bipartisan Infrastructure Law (BIL). These Acts transformed 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 following 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

The CMMPO's PBPP process is shaped by both federal transportation performance management requirements and the MPO's regional goals and objectives. These locally-customized goals and objectives have been integrated through each of the federally-established "Planning Emphasis Areas" when developing transportation plans and projects. By addressing the defined emphasis areas in all areas of the transportation planning process, the CMMPO is able to create more balanced and holistic transportation projects and corresponding policy 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 the established goals.

The following summary covers the federally-required performance measure related to freight.

Truck Travel Time Reliability (TTTR)

TTTR is the amount of time it takes trucks to drive the length of a highway segment. This measure is only calculated on the Interstate System. The following methodology is applied to determine TTTR for various times of the day:

1. Calculate the travel times from the five time periods used in this measure (shown in **Figure 18**)
2. Find and calculate the TTTR ratio from the 50th and 95th percentile times for each time period
3. The TTTR Index is generated by multiplying each highway segment's largest ratio of the five periods by its length, then dividing the sum of all length-weighted segments by the total length of Interstate.

Figure 18

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

MassDOT TTTR Targets and CMMPO Comparison

MassDOT followed FHWA regulation in measuring TTTR on the Interstate System using the NPMRDS provided by FHWA. These performance measures aim to identify the predictability of travel times on the major highway network by comparing the average travel time along a given segment against longer travel times. **Table 6** shows the annual TTTR ratio results from 2017 to 2022 for both statewide and CMMPO region. The 2-year (2024) and 4-year (2026) LOTTR targets for the Interstate system are also shown. The first performance period target (2022) is also included for comparison. The TTTR ratio in 2020 is well below the previous three (3) years of data due to the COVID-19 pandemic as people were either required to stay at home and/or work from home, which generated far less vehicles on the Interstate System. The following

statewide and CMMPO Interstate and Non-Interstate percentages are from the Probe Data Analytics Suite of the Regional Integrated Transportation Information System (RITIS) website. The CMMPO region includes I-90 (Massachusetts Turnpike), I-190, I-290 and I-395. All but I-190 travels through a part of the Southwest planning subregion.

Table 6 – Annual TTTR Ratio Results for Statewide & CMMPO Interstates

Year	Statewide Interstate TTTR Ratio	CMMPO Interstate TTTR Ratio	Interstate TTTR Target		
			2022	2024	2026
2017	1.81	1.71	1.85	1.80	1.75
2018	1.88	1.79			
2019	1.84	1.77			
2020*	1.44	1.22			
2021	1.61	1.59			
2022	1.71	1.61			

**COVID-19 pandemic occurred during 2020*

4.2 Environmental Consultation

Major features of the natural environment in the Southwest planning subregion were also identified as part of this *Accommodation Assessment study*. The following maps show major environmental systems within the study area that have impacts on such things as drainage, water quality and wildlife migration.

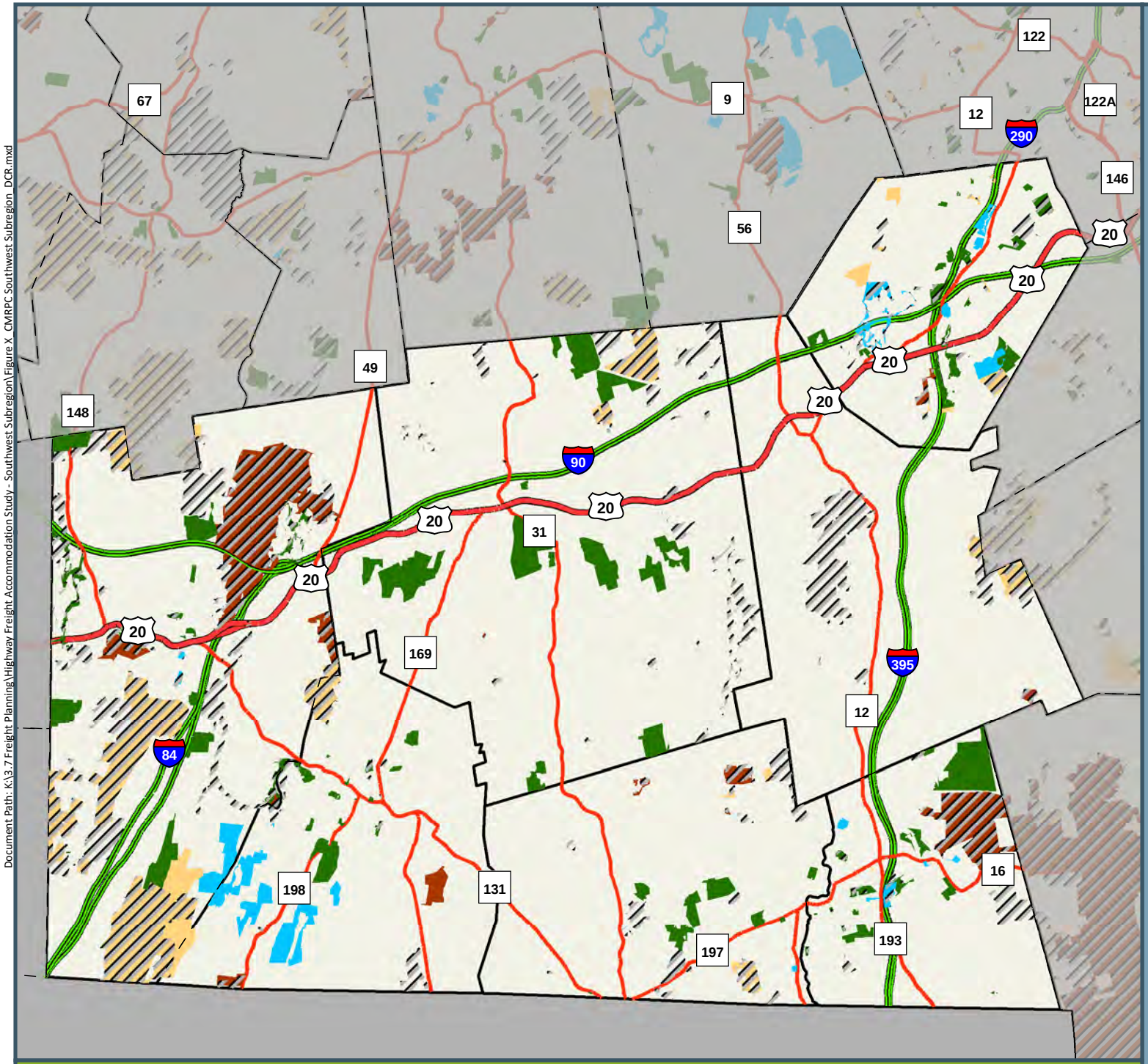
Figure 19 shows general land use within the Southwest subregion which includes recreation, conservation, water supply, and open space areas. This data is managed by the Massachusetts Department of Conservation and Recreation (DCR). The mission of the DCR is to protect, promote and enhance the state's wealth of natural, cultural and recreational resources. As the map shows, there is a large recreation/conservation area in the northeast part of Sturbridge and a significant amount of conservation areas both east and west of Interstate 84.

Figure 20 shows wetland areas within the Southwest subregion study area. Wetlands are areas where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods of time during the year. The data comes from the Massachusetts Department of Environmental Protection (DEP). The DEP is responsible for ensuring clean air and water, safe management and recycling of solid and hazardous wastes, timely cleanup of hazardous waste sites and spills, and the preservation of wetlands and coastal resources. Included in the map are bogs, marshes, swamps, and open water. The large area of open water in Webster is Lake Chaubunagungamaug. As can be seen, there are numerous defined wetlands in this subregion.

As shown in **Figure 21**, the federal National Heritage & Endangered Species Program (NHESP) provides the data for vernal pools and rare species habitats (plants & animals). Vernal pools are

small, shallow ponds characterized by lack of fish and by periods of dryness. The overall goal of the NHESP is the protection of the state's wide range of native biological diversity. The NHESP is responsible for the conservation and protection of hundreds of species that are not hunted, fished, trapped, or commercially harvested in the state. As can be seen in the map, there are significantly far more potential vernal pools when compared to certified vernal pools in the Southwest planning subregion. Most of the certified vernal pools are in the communities of Oxford, Sturbridge, and Webster. Further, each of the seven (7) towns in the study area has priority habitats of rare species, particularly Southbridge and Sturbridge.

Flood zones were created by the Federal Emergency Management Agency (FEMA) as a guide to establishing corresponding National Flood Insurance Rates. The 100-year flood zone means that there is a one percent annual chance of a flood within that defined area. The 500-year flood zone means that there is a 0.2 percent annual chance of a flood. The closer something is to the flooding source - river, stream, pond, etc. - the greater the risk of flooding. Flood zones are also used to calculate flood insurance rates for homes and businesses. **Figure 22** shows all the 100 and 500-year flood zones in the Southwest planning subregion. Most flood zones in the Southwest subregion are 100-year, specifically large areas in Auburn, Charlton, Oxford, and Webster. In addition, there are a several smaller 500-year flood zones in each of the Southwest subregion communities.



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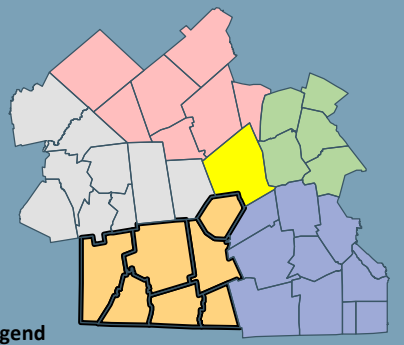

Legend

DCR Open Space

- Recreation/Conservation
- Conservation (Non Facility)
- Recreation (Facility Based)
- Water Supply Protection
- Open Space in Perpetuity
- **Interstate**
- **US Highway**
- **State Route**
- **Southwest Subregion Towns**

Information depicted on this map is for planning purposes only. This information is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analysis. Use caution interpreting positional accuracy.

Produced by the Central Massachusetts Regional Planning Commission (CMRPC)
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Worcester, MA 01608

Source: Data provided by the Central Massachusetts Regional Planning Commission (CMRPC), MassDOT/ Office of Geographic Information (MassGIS), Massachusetts Department of Environmental Protection

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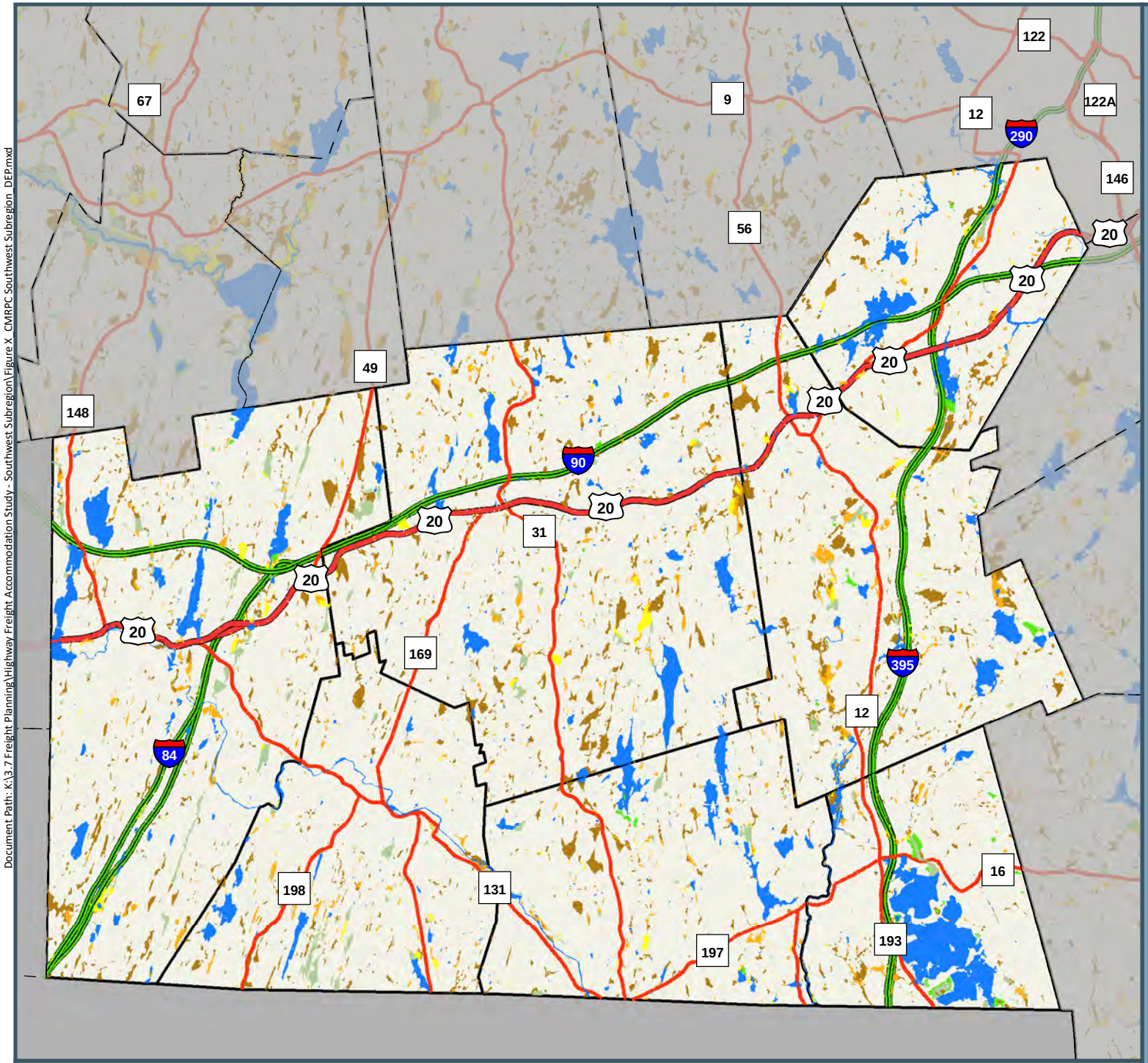
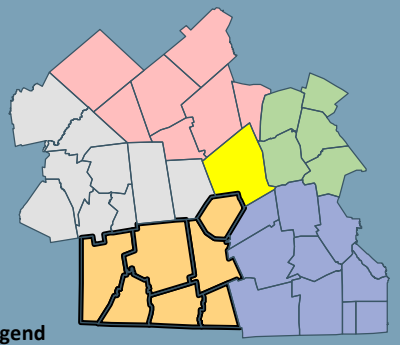
FIGURE 19 - SOUTHWEST SUBREGION GENERAL LAND USE (DCR)





Legend

- OPEN WATER
- BOG
- DEEP MARSH
- SHALLOW MARSH MEADOW OR FEN
- SHRUB SWAMP
- WOODED SWAMP
- **Interstate**
- **US Highway**
- **State Route**
- **Southwest Subregion Towns**

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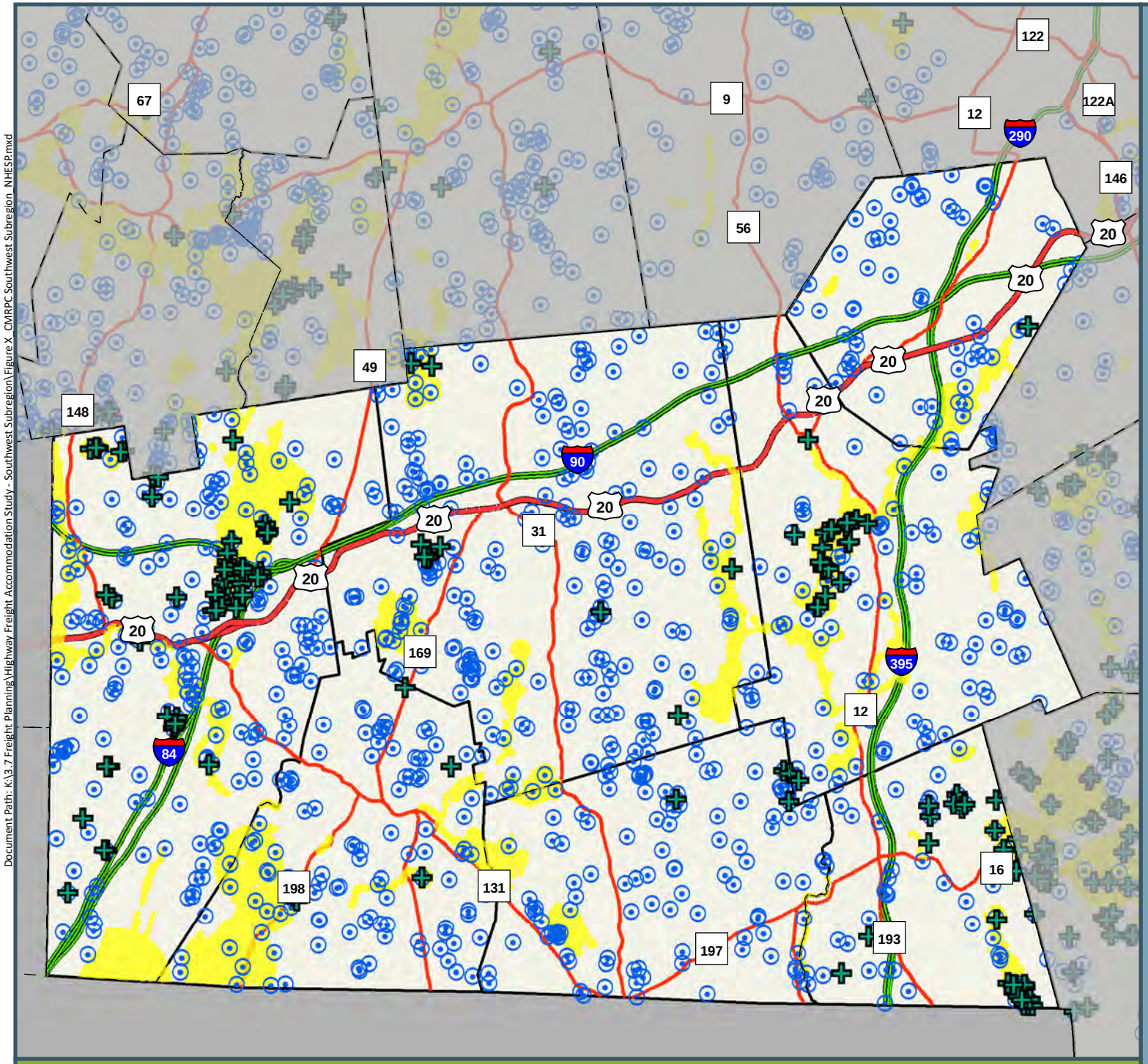
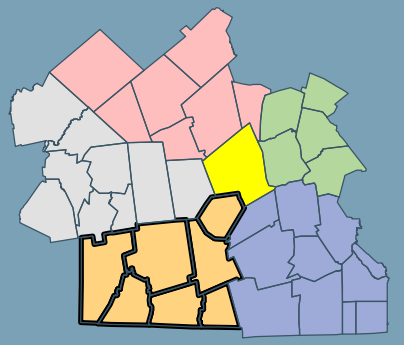
FIGURE 20 - SOUTHWEST SUBREGION WETLANDS (DEP)





Legend

- NHESP Certified Vernal Pools
- NHESP Potential Vernal Pools
- NHESP Priority Habitats of Rare Species
- Interstate
- US Highway
- State Route
- Southwest Subregion Towns

N

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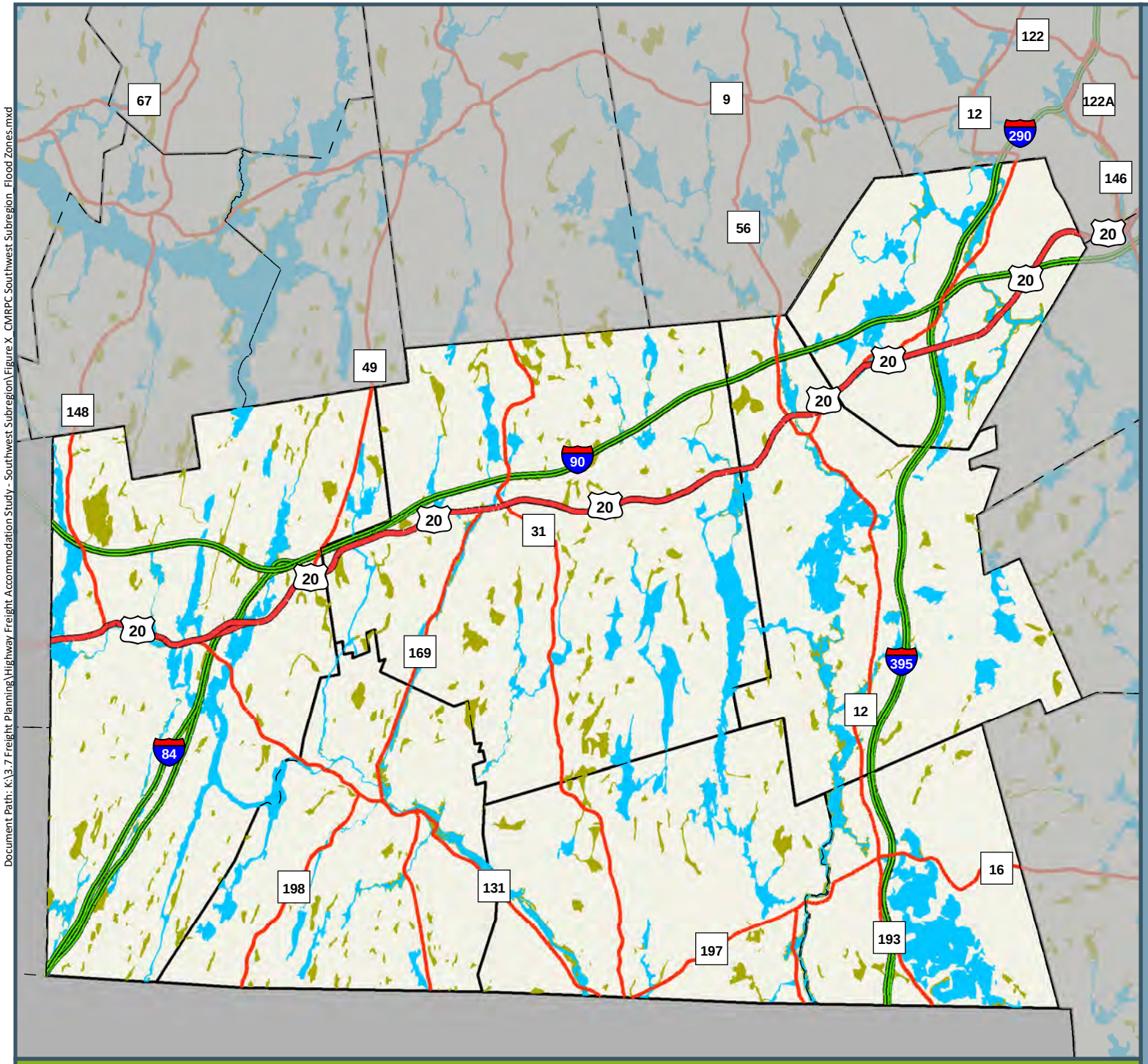
FIGURE 21 - SOUTHWEST SUBREGION VERNAL POOLS & RARE SPECIES HABITATS (NHESP)



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Source: Data provided by the Central Massachusetts Regional Planning Commission (CMRPC), MassDOT/ Office of Geographic Information (MassGIS), Massachusetts Department of Environmental Protection

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Document Path: K:\3.7 Freight Planning\Highway Freight Accommodation Study - Southwest Subregion\Figure X_CMRPC Southwest Subregion_Flood Zones.mxd

FIGURE 22 - SOUTHWEST SUBREGION 100/500 YEAR FLOOD ZONES (FEMA)

4.3 Municipal Vulnerability Preparedness (MVP)

The state's MVP Program provides planning grants to municipalities to complete vulnerability assessments and develop action-oriented resiliency plans. Communities that complete the MVP planning process become certified "MVP Communities" and are eligible for Action Grant funding and other opportunities through the Commonwealth. Critical to this process, various stakeholders actively engage in discussions to determine the top hazards related to climate change that currently impact or could have a future impact on a community.

Figure 23 shows the established Evacuation Routes and the Hazardous Dams within the Southwest subregion communities. The Evacuation Routes were developed as part of the Worcester County Evacuation Plan. During the compilation of the Evacuation Plan, each community identified their important roadways and defined them as primary, secondary, or tertiary Evacuation Routes. Besides the State Numbered Routes, other major roads were designated as Evacuation Routes. As the map shows, the Evacuation Routes may have a primary designation in one town but a secondary designation in an adjoining town.

As for the Hazardous Dams, this data is maintained by the Massachusetts Office of Dam Safety. The map shows the dams classified into three categories. The categories are High Hazard, Significant Hazard, and Low Hazard. The hazards are defined as follows:

- **High Hazard**: Located where failure will likely cause loss of life and serious damage to homes, industrial or commercial facilities, important public utilities, main highways or railroads.
- **Significant Hazard**: Located where failure may cause loss of life and damage homes, industrial or commercial facilities, secondary highways or railroads or cause interruption of use or service of relatively important facilities.
- **Low Hazard**: Located where failure may cause minimal property damage to others. Loss of life is not expected.

The town of Auburn has the most High Hazard dams with a total of five (5). The town of Webster is the only community in the Southwest subregion without a High Hazard dam. There are also numerous dams located near State Numbered Routes. In fact, all the Southwest subregion communities have multiple hazardous dams.

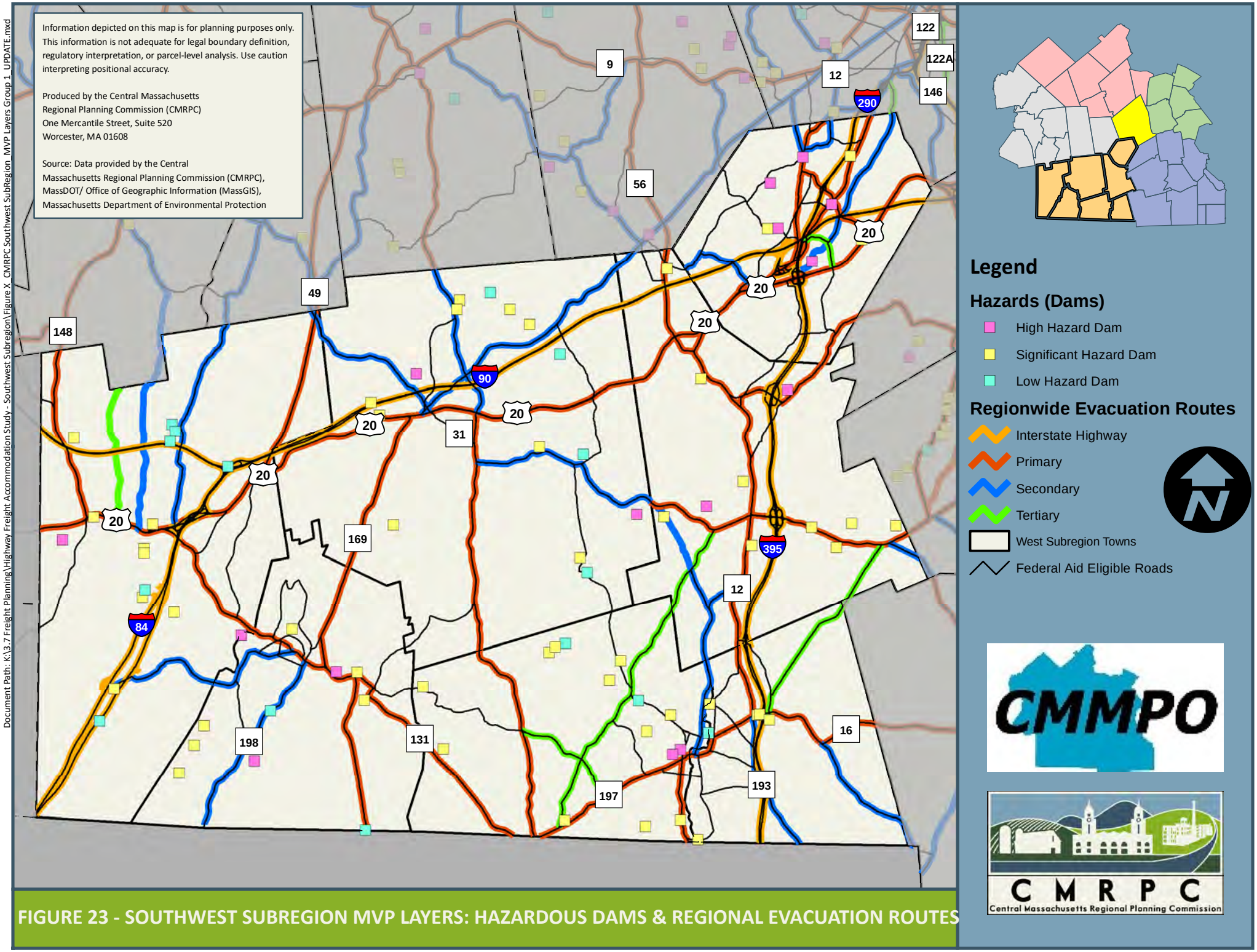


FIGURE 23 - SOUTHWEST SUBREGION MVP LAYERS: HAZARDOUS DAMS & REGIONAL EVACUATION ROUTES

Figure 24 shows locally-identified vulnerable critical infrastructure and hazards within the Southwest subregion communities. The types of vulnerable critical infrastructure can differ for each community. The types of infrastructure include major roadways, dams, water & sewer pumping stations, and important buildings such as police stations, fire stations, or Department of Public Works (DPW) garages. The towns of Charlton, Dudley, and Sturbridge consider all the State Numbered Routes in their respective communities as critical infrastructure. Most of the communities in the Southwest subregion considered the police stations, fire stations, and DPW garages as critical infrastructure. Bridges, dams, libraries, pumping stations, schools, and solar farms were also considered critical infrastructure in most of the towns.

Most towns in the Southwest subregion contain numerous locally-identified hazards, except for Southbridge. These hazards include dams, flooding issues (past & present), snowdrifts & icing during the winter, and areas for potential fires. Fire hazards were identified in the towns of Auburn, Oxford, and Webster. Flooding hazards were identified in each of the seven (7) Southwest subregion communities.

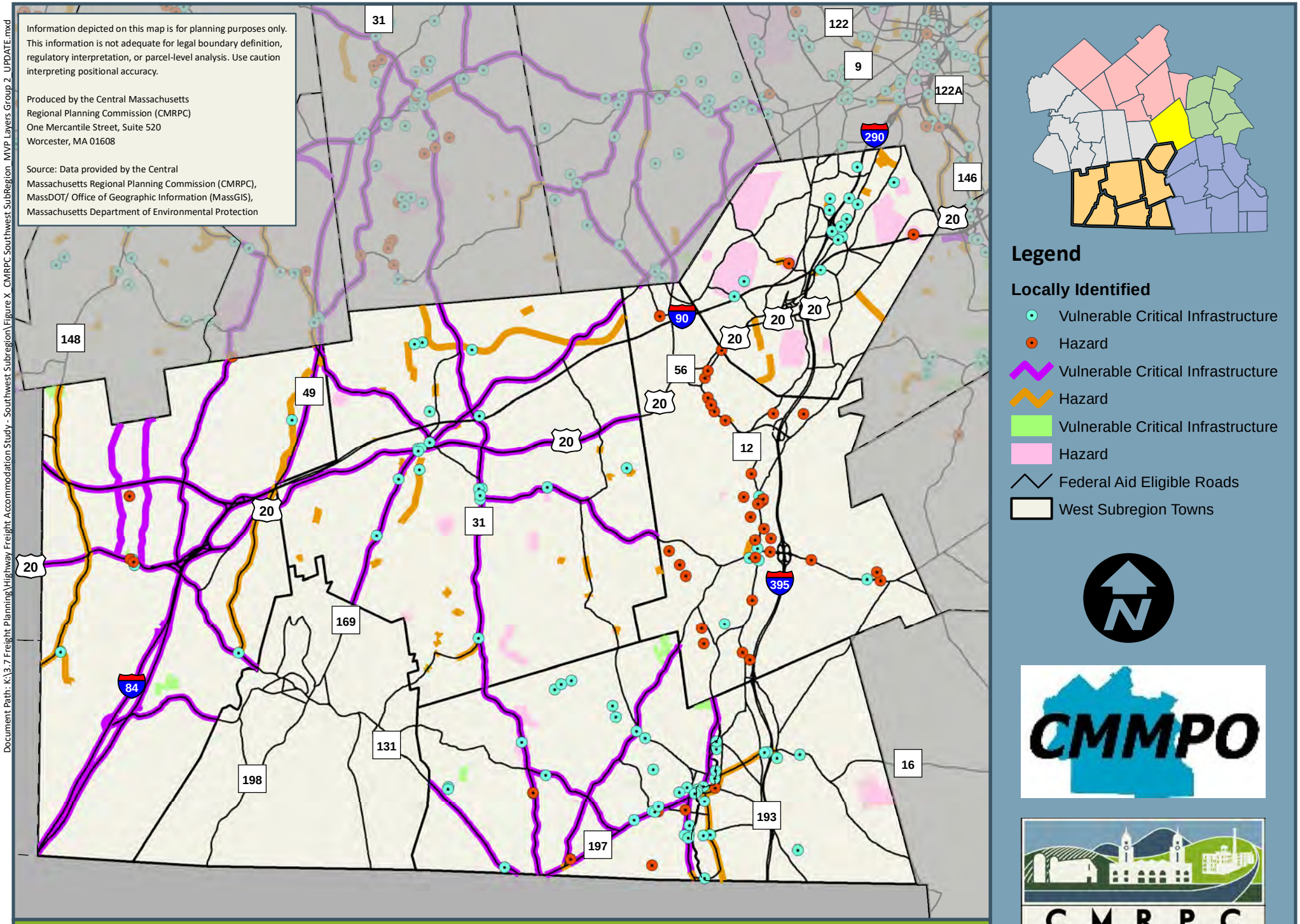


FIGURE 24 - SOUTHWEST SUBREGION MVP LAYERS: LOCALLY IDENTIFIED HAZARDS & CRITICAL INFRASTRUCTURE

4.4 Travel Demand Model

Introduction

In this installment in the series of *Highway Freight Accommodation Assessment* studies focusing on the federal-aid highway system, the region's Travel Demand Forecasting Model ("Model") software was used to estimate and compile the anticipated Vehicle Miles of Travel (VMT) of heavy vehicles - transporting a broad range of freight - for both existing & projected future conditions in the Southwest planning subregion. Potential future year land development impacting the Southwest planning subregion was assessed by the CMRPC staff and this information was used to craft future benchmark year growth scenarios for all host communities in the subregion. Considered a tool for projecting future year traffic impacts and future traffic growth, the results of the Model need to be considered in a relative sense and must be viewed only as "best estimates" based on currently available information.

The Model is a computer-based simulation of the greater planning region's multimodal transportation network and includes all roads on the federal-aid highway system and public fixed-route transit routes. After developing traffic volumes by time of day for all network roads, the Model then reports VMT (and Vehicle Hours of Travel, VHT) aggregated to a community level for each roadway classification - the Federal Highway Administration's (FHWA) roadway functional classifications are used - and vehicle type. The Model's 2018 base year analysis network, representing an existing case, has been "calibrated", or adjusted, to essentially simulate existing roadway travel conditions, based on field-observed traffic volumes which include the percentage of heavy vehicles.

For the purposes of this study effort, the regional Model was utilized to estimate heavy vehicle VMT for the Morning (6 AM-9 AM) peak travel period, Mid-Day (9 AM-3 PM) period, the Evening (3 PM-6 PM) peak, as well as Nighttime (6 PM-6 AM) travel period, resulting in Daily totals. The Model-calculated estimated VMT has also been summarized for each host community in the Southwest planning subregion. Using the 2018 existing scenario as a basis for the projected future-year analyses, heavy vehicle VMT estimates have been derived by the Model for the benchmark years of 2030 and 2040. *(It should be noted that the Model analyses do not reflect the known/unknown impacts of the Covid-19 crisis.)*

Truck Type Groupings

The Model results provide truck VMT estimates within three (3) broad groupings of the FHWA's Vehicle Classifications. Shown in **Table 7** are the 13 established FHWA Vehicle Classifications. The table indicates the equivalences between the FHWA Vehicle Classifications and the corresponding three (3) categories of truck type groupings used by the Model. As can be seen in the table, in addition to "Auto", these groupings are defined as "Light Trucks", "Medium Trucks" and "Heavy Trucks". Light Trucks are commercial vehicles with 4 or 6 tires while

Medium Trucks are single unit commercial vehicles with more than 6 tires. Heavy Trucks are all articulated vehicles.

Table 7
FHWA Vehicle Classification

Classification Number	Description	Type of Vehicle
1	Motorcycles	Auto
2	Passenger Cars	Auto
3	Pickups and Vans	Auto
4	Buses	Medium Truck
5	Single Unit 2 Axle Truck	Light Truck
6	Single Unit 3 Axle Truck	Medium Truck
7	Single Unit 4 Axle Truck	Medium Truck
8	Trailer 3 or 4 Axle Truck	Heavy Truck
9	Trailer 5 Axle Truck	Heavy Truck
10	Trailer 6 Axle Truck	Heavy Truck
11	Multi-Trailer 5 Axle Truck	Heavy Truck
12	Multi-Trailer 6 Axle Truck	Heavy Truck
13	Multi-Trailer 7 or More Axle Truck	Heavy Truck

These Model analyses results for each host community in the Southwest planning subregion are summarized in **Tables 8, 9, & 10** for each defined truck type grouping. Although the primary purpose of the *Accommodation Assessment* study series is to focus on the federal-aid eligible State Numbered Routes in each of the defined CMRPC planning subregions, the Model analyses summaries presented for each host community ***do not*** reflect, where applicable, Interstate System truck VMT. Thus, both estimated and projected truck VMT totals for I-84, I-90 (Massachusetts Turnpike, "MassPike"), I-290 and I-395 are ***not*** reflected in the community totals shown in the following summary tables. Accordingly, **Table 8** includes the estimated truck VMT for the 2018 existing case, **Table 9** includes the projected truck VMT for the future year 2030, and **Table 10** lists the projected truck VMT for the future year 2040. Again, the listed VMT are by time of day: AM Peak, Mid-Day (MD), PM Peak, Nighttime (NT) as well as the Daily total.

Truck Vehicle Miles of Travel (VMT) Observations

As can be seen in **Table 8**, truck Vehicles Miles of Travel (VMT) under the existing 2018 case are highest in the town of Sturbridge with total estimated daily truck VMT of nearly 50,300 miles, largely due to the heavily utilized US Route 20 corridor as well as State Numbered Routes 49, 131, and 148. Further, due to the location of the I-90 (MassPike)/I-84 interchange in Sturbridge, trucks from a broad geographic area are attracted to this host community. Next, the town of Auburn exhibits truck VMT of 39,100 miles. Like Sturbridge, the US Route 20

corridor contributes in large part to the truck VMT estimated in Auburn as does Route 12 which serves the community's numerous commercial areas. The town of Charlton, another US Route 20 host community, ranks third with 32,200 miles. Routes 31 and 169 also accommodate notable truck VMT in Charlton. Southbridge follows Charlton with nearly 29,100 miles using Routes 131, 169 and 198 in that community. Oxford is next with nearly 25,100 miles due to the US Route 20 corridor in the northern part of the community as well as Routes 12 and 56. Truck VMT in Oxford also utilizes Sutton Avenue in order to access the Route 146 corridor located in the adjacent Southeast planning subregion. Webster accommodates 23,300 miles on Routes 12, 16 and 193 while neighboring Dudley exhibits the lowest estimated total daily truck VMT with 18,100 miles utilizing Routes 131 and 197 in that host community.

Table 8
Existing Truck VMTs: 2018 Benchmark Year

	2018												
	AM			MD			PM			NT			
	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	VMT Totals
Auburn	5,293	2,986	1,377	6,216	3,488	1,613	5,672	3,236	1,488	4,300	2,359	1,079	39,106
Charlton	3,496	3,117	1,323	4,149	3,676	1,555	3,696	3,345	1,411	2,922	2,482	1,044	32,216
Dudley	2,009	1,524	843	2,382	1,796	994	2,165	1,620	896	1,695	1,304	880	18,109
Oxford	2,973	2,321	943	3,492	2,674	1,078	3,186	2,459	994	2,438	1,811	724	25,092
Southbridge	3,994	1,872	1,118	4,682	2,210	1,315	4,302	1,998	1,191	3,339	1,695	1,366	29,081
Sturbridge	6,465	3,450	2,192	7,698	4,115	2,617	6,960	3,717	2,368	5,673	2,988	2,032	50,276
Webster	3,002	1,830	843	3,575	2,202	1,018	3,206	1,956	902	2,537	1,545	702	23,319
Totals	27,231	17,101	8,638	32,194	20,160	10,191	29,189	18,332	9,249	22,904	14,184	7,826	217,198

Shown in **Table 9**, under anticipated 2030 conditions, total daily estimated truck VMT remains highest in the town of Sturbridge with 56,700 miles, again largely due to the heavily utilized US Route 20 corridor, the critical I-90 (MassPike)/I-84 interchange as well as State Numbered Routes 49, 131, and 148. The host community of Auburn then follows with projected future year 2030 total daily truck VMT over 42,100 miles. As previously noted, the US Route 20 corridor contributes in large part to Auburn's projected daily truck VMT as does Route 12 serving the numerous commercial areas in the town. The town of Charlton is next with future year daily projected truck VMT anticipated to exceed 37,100 miles. The US Route 20 corridor accommodates significant truck VMT in Charlton as does both Routes 31 and 169. Projected future 2030 benchmark year total daily truck VMT for the town of Southbridge is expected to increase to just shy of 32,000 miles using Routes 131, 169 and 198 in that host community. Oxford follows, anticipated to accommodate truck VMT over 28,300 miles. Again, the US Route 20 corridor and State Numbered Routes 12 and 56 serve trucking operations in the town of Oxford. Again, as previously mentioned, projected truck VMT in Oxford will also utilize Sutton Avenue to gain access to the Route 146 corridor in the neighboring town of Sutton. Under projected 2030 conditions, Webster is anticipated to accommodate almost 26,000 miles on that host community's highway network which includes Routes 12, 16 and 193. Lastly, similar to the

existing 2018 scenario, the town of Dudley will continue to accommodate the lowest estimated total daily truck VMT in the 2030 benchmark year with nearly 19,900 miles utilizing Routes 131 and 197 and other roadways in that community.

Table 9
Projected Truck VMTs: Future 2030 Condition

	2030												
	AM			MD			PM			NT			
	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	VMT Totals
Auburn	5,582	3,300	1,531	6,589	3,854	1,788	6,015	3,611	1,666	4,504	2,528	1,171	42,139
Charlton	3,968	3,657	1,560	4,711	4,284	1,827	4,221	3,948	1,680	3,305	2,799	1,180	37,141
Dudley	2,210	1,698	960	2,631	2,000	1,134	2,386	1,821	1,026	1,841	1,381	772	19,860
Oxford	3,288	2,656	1,083	3,874	3,061	1,244	3,542	2,871	1,171	2,691	2,034	812	28,327
Southbridge	4,446	2,089	1,279	5,218	2,466	1,513	4,827	2,236	1,373	3,721	1,743	1,079	31,990
Sturbridge	7,401	3,845	2,502	8,840	4,594	2,990	7,928	4,129	2,693	6,431	3,271	2,093	56,717
Webster	3,363	2,031	940	3,981	2,446	1,134	3,585	2,150	999	2,831	1,715	783	25,958
Totals	30,257	19,276	9,855	35,845	22,704	11,630	32,504	20,767	10,608	25,323	15,471	7,892	242,133

Looking to the 2040 future benchmark year, as shown in **Table 10**, overall daily truck VMT is projected to further grow in these same Southwest subregion host communities, although, based on currently available information, at a more modest rate than projected between 2018 & 2030. Total daily truck VMT will remain highest at over 57,700 miles in the town of Sturbridge, again due to the attractive US Route 20 corridor, the highly utilized I-90 (MassPike)/I-84 interchange and Routes 49, 131, and 148. Similar to the prior decade, projected truck VMT in the town of Auburn will continue to rank second in the Southwest subregion exhibiting a daily total of just over 43,000 miles. Total daily truck VMT in the town of Charlton will also continue to increase under projected 2040 conditions, although at a lesser rate. This is also the case for the host communities of Southbridge and Oxford where the anticipated daily truck VMT will perhaps be more limited than in the prior decade. Elsewhere, in the other Southwest subregion towns of Webster and Dudley, modest increases in total daily truck VMT are anticipated under projected future year 2040 conditions.

Table 10
Projected Truck VMTs: Future 2040 Condition

	2040												
	AM			MD			PM			NT			
	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	VMT Totals
Auburn	5,679	3,375	1,579	6,696	3,930	1,838	6,131	3,703	1,719	4,575	2,601	1,219	43,045
Charlton	4,077	3,786	1,624	4,841	4,448	1,908	4,339	4,100	1,756	3,388	2,906	1,231	38,403
Dudley	2,295	1,760	991	2,722	2,070	1,169	2,469	1,887	1,057	1,905	1,430	796	20,550
Oxford	3,394	2,760	1,135	4,008	3,195	1,309	3,652	2,988	1,228	2,770	2,117	853	29,410
Southbridge	4,524	2,130	1,304	5,307	2,520	1,544	4,886	2,273	1,395	3,784	1,783	1,103	32,554
Sturbridge	7,484	3,934	2,569	8,948	4,697	3,071	8,042	4,230	2,769	6,513	3,345	2,152	57,753
Webster	3,402	2,075	966	4,056	2,494	1,165	3,647	2,195	1,026	2,879	1,755	808	26,468
Totals	30,855	19,819	10,169	36,578	23,355	12,004	33,165	21,377	10,950	25,814	15,936	8,161	248,183

The corresponding percentage increases and decreases in projected truck VMT in the Southwest transportation planning subregion during the various travel periods of a typical day are provided in **Tables 11 & 12. Table 11** summarizes the percentage increases anticipated in the 12-year period between 2018 and 2030. Again, truck VMT using the Interstate System are ***not*** included to allow enhanced focus on the anticipated impacts to federal-aid eligible State Numbered Routes. Corresponding anticipated percentage increases ranging from 16.5 to 19.1% for medium and heavy trucks during various travel periods of a typical day are anticipated in the town of Charlton, likely due mostly to the US Route 20 corridor as well as Routes 31 and 169. Elsewhere, in the host communities of Dudley, Oxford, Southbridge, and Sturbridge the projected percentage increases of especially heavy truck VMT are substantive, ranging from 13.8 to 17.8% depending on travel period. Notably, Oxford will likely experience measurable increases in both medium and heavy truck VMT due to US Route 20, the Route 12 corridor, Route 56 as well as Sutton Avenue that connects to Route 146 to the east in the neighboring town of Sutton via Central Turnpike. Interestingly, the Model anticipates a reduction in Nighttime heavy truck VMT in the host communities of Dudley and Southbridge of -12.2% and -21.0%, respectively.

Table 11
Projected Truck VMTs: Percentage Increases 2018-2030

	Change 2018 to 2030											
	AM			MD			PM			NT		
	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck
Auburn	5.5%	10.5%	11.2%	6.0%	10.5%	10.9%	6.0%	11.6%	11.9%	4.7%	7.2%	8.6%
Charlton	13.5%	17.3%	17.9%	13.5%	16.5%	17.5%	14.2%	18.0%	19.1%	13.1%	12.8%	13.1%
Dudley	10.0%	11.4%	13.8%	10.5%	11.4%	14.1%	10.2%	12.4%	14.5%	8.6%	5.9%	-12.2%
Oxford	10.6%	14.4%	14.8%	10.9%	14.5%	15.4%	11.2%	16.8%	17.8%	10.4%	12.3%	12.3%
Southbridge	11.3%	11.6%	14.5%	11.4%	11.6%	15.0%	12.2%	11.9%	15.3%	11.4%	2.8%	-21.0%
Sturbridge	14.5%	11.4%	14.1%	14.8%	11.6%	14.3%	13.9%	11.1%	13.7%	13.3%	9.5%	3.0%
Webster	12.0%	11.0%	11.6%	11.3%	11.1%	11.3%	11.8%	9.9%	10.8%	11.6%	11.0%	11.5%

Similarly, **Table 12** summarizes the percentage increases in VMT anticipated between the future benchmark years of 2030 and 2040. Less is presently known about likely travel conditions in this future time parameter. As such, more modest truck grouping VMT percentage increases are likely than in the previous 12-year analysis period. During the ten-year period between 2030 and 2040, the anticipated percentage increases in truck VMT are projected to be predominately less than 4% overall, ranging from 1.1-3.9%. Notably, the towns of Charlton and Oxford are projected to accommodate truck VMT increases exceeding 4% in both medium and heavy trucks, depending on daily travel period. During this decade, the percentage increase of heavy truck VMT is expected to outpace the growth in light and medium truck VMT in the Southwest transportation planning subregion.

Table 12
Projected Truck VMTs: Percentage Increases 2030-2040

	Change 2030 to 2040											
	AM			MD			PM			NT		
	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck
Auburn	1.7%	2.3%	3.1%	1.6%	2.0%	2.8%	1.9%	2.6%	3.2%	1.6%	2.9%	4.0%
Charlton	2.8%	3.5%	4.1%	2.8%	3.8%	4.4%	2.8%	3.9%	4.5%	2.5%	3.8%	4.3%
Dudley	3.9%	3.6%	3.2%	3.4%	3.5%	3.1%	3.5%	3.6%	3.1%	3.5%	3.5%	3.1%
Oxford	3.2%	3.9%	4.8%	3.5%	4.4%	5.3%	3.1%	4.1%	4.9%	2.9%	4.1%	5.0%
Southbridge	1.8%	2.0%	1.9%	1.7%	2.2%	2.1%	1.2%	1.6%	1.6%	1.7%	2.3%	2.2%
Sturbridge	1.1%	2.3%	2.7%	1.2%	2.3%	2.7%	1.4%	2.5%	2.8%	1.3%	2.3%	2.8%
Webster	1.2%	2.2%	2.7%	1.9%	2.0%	2.7%	1.7%	2.1%	2.7%	1.7%	2.3%	3.1%

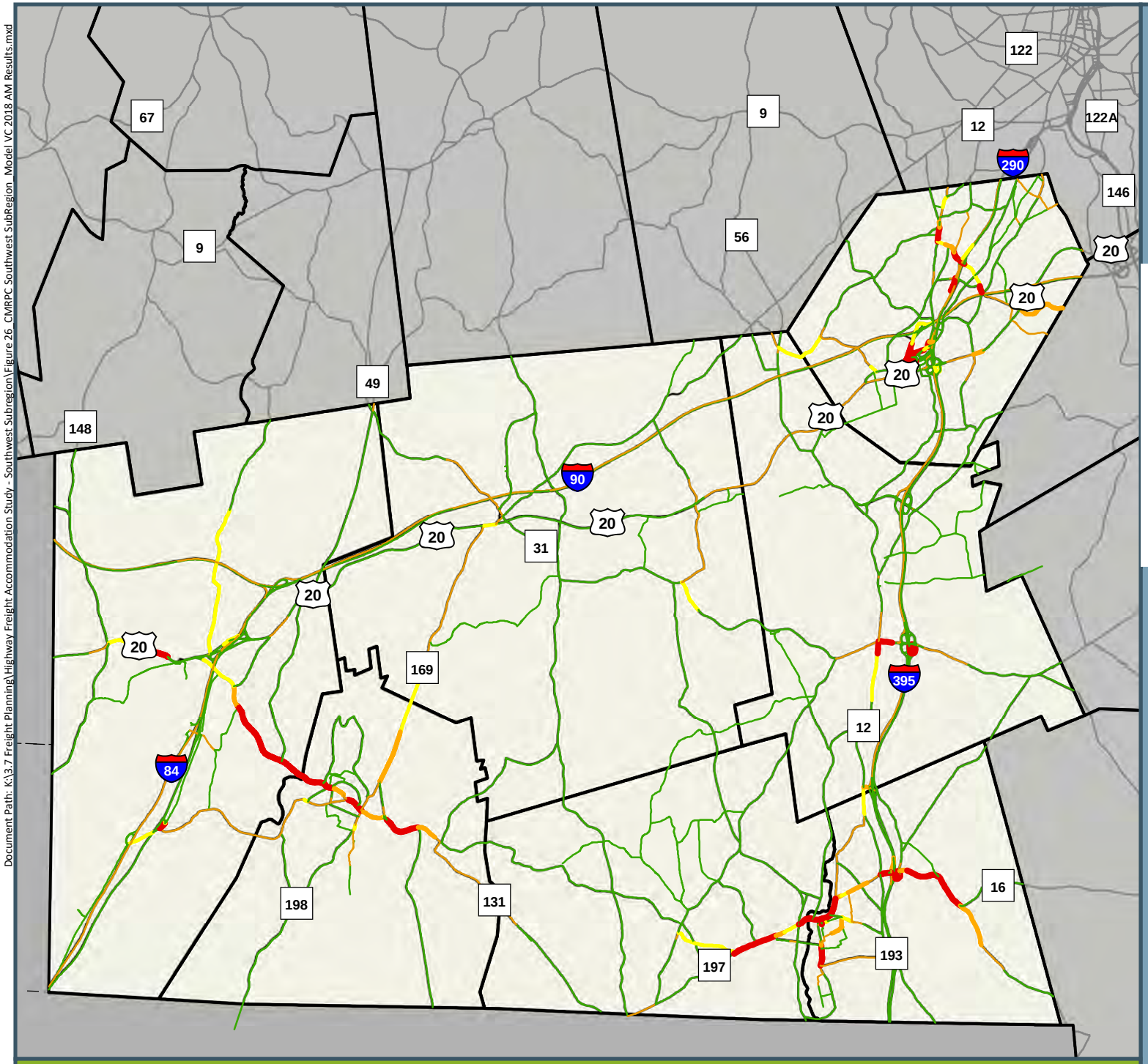
Rural Congestion in the Southwest Subregion

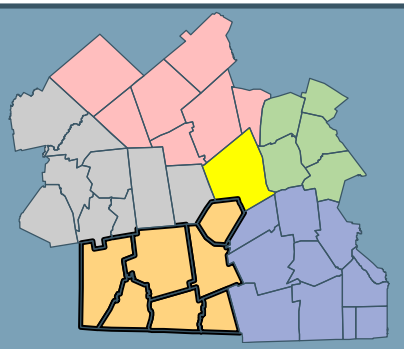
In an effort to detect existing rural congestion and its potential future year spread, the Model was used to calculate Volume-to-Capacity ("V/C") ratio data ranges for the host communities in the Southwest planning subregion. The higher the V/C ratio, the more indicative of heavy travel. Where the peak period Models cover a 3-hour period, using a V/C ratio of 0.80 for the 3 hours would suggest that one of the 3 hours is close to or beyond a V/C ratio value of 1.0. This is indicative of the fact that traffic volumes are not distributed uniformly over the 3 hours, but rather have a peak hour within the 3 hours with traffic volumes building or declining on either side of the peak. V/C ratios exceeding 1.0 theoretically indicate *over-capacity* conditions with significant incurred vehicle delay. As a product of this exercise, the following color-coded maps showing the analyses results were compiled and are shown in **Figures 25 through 30.**

Model-Calculated V/C Ratio Observations

As previously mentioned, the Model's 2018 analysis network has been "calibrated", or adjusted, to best estimate existing roadway travel conditions, based on field-observed traffic volumes which include the percentage of heavy vehicles. Under the 2018 existing case, shown in **Figures 25 & 26**, during both the morning and evening peak travel periods, V/C ratios in

excess of 0.80 are anticipated in Auburn along Oxford Street, Auburn Street and the Drury Square area as well as Route 12 near the interchange with I-90 (MassPike). In the town of Oxford, V/C ratios in excess of 0.80 are projected during both peak travel periods in the town center area along Route 12, Sutton Avenue and the I-395 interchange area. In the host communities of Southbridge and Sturbridge, the Route 131 corridor between US Route 20 and downtown Southbridge exhibits anticipated V/C ratios in excess of 0.80 during both peak travel periods. During the evening peak travel period, the Route 169 corridor in Southbridge also indicates V/C ratios in excess of 0.80. The commercial area along US Route 20 in Sturbridge also shows peak travel period V/C ratios in excess of 0.80 during both the morning and evening peaks. Notably, Route 16, Route 193 and Route 197 in the host communities of Dudley and Webster exhibit congested travel conditions in both the AM and PM peak periods with projected V/C ratios in excess of 0.80.





Legend

2018 VC Ratios_AM

- 0.00 - 0.40
- 0.41 - 0.60
- 0.61 - 0.70
- 0.71 - 0.80
- > 0.80
- Southwest Subregion Towns

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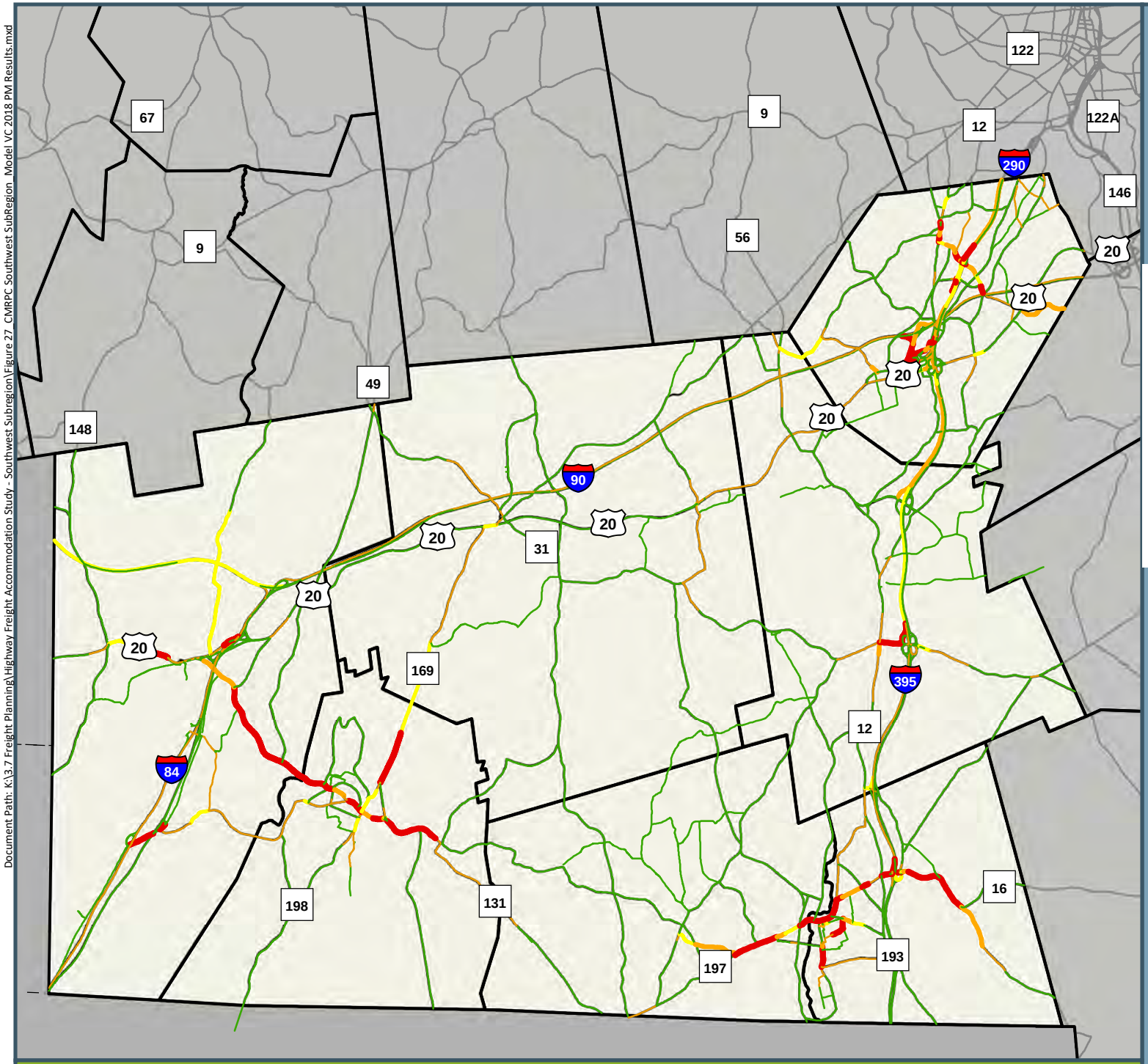
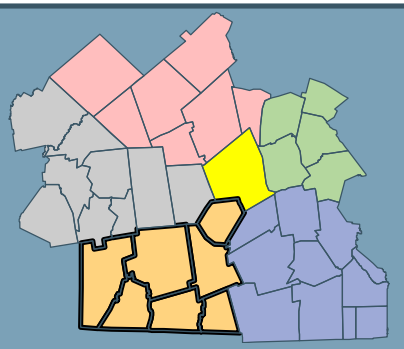
FIGURE 25 - SOUTHWEST SUBREGION EXISTING 2018 V/C RATIOS, AM PEAK PERIOD





Legend

2018 VC Ratios_PM

- 0.00 - 0.40
- 0.41 - 0.60
- 0.61 - 0.70
- 0.71 - 0.80
- > 0.80
- Southwest Subregion Towns

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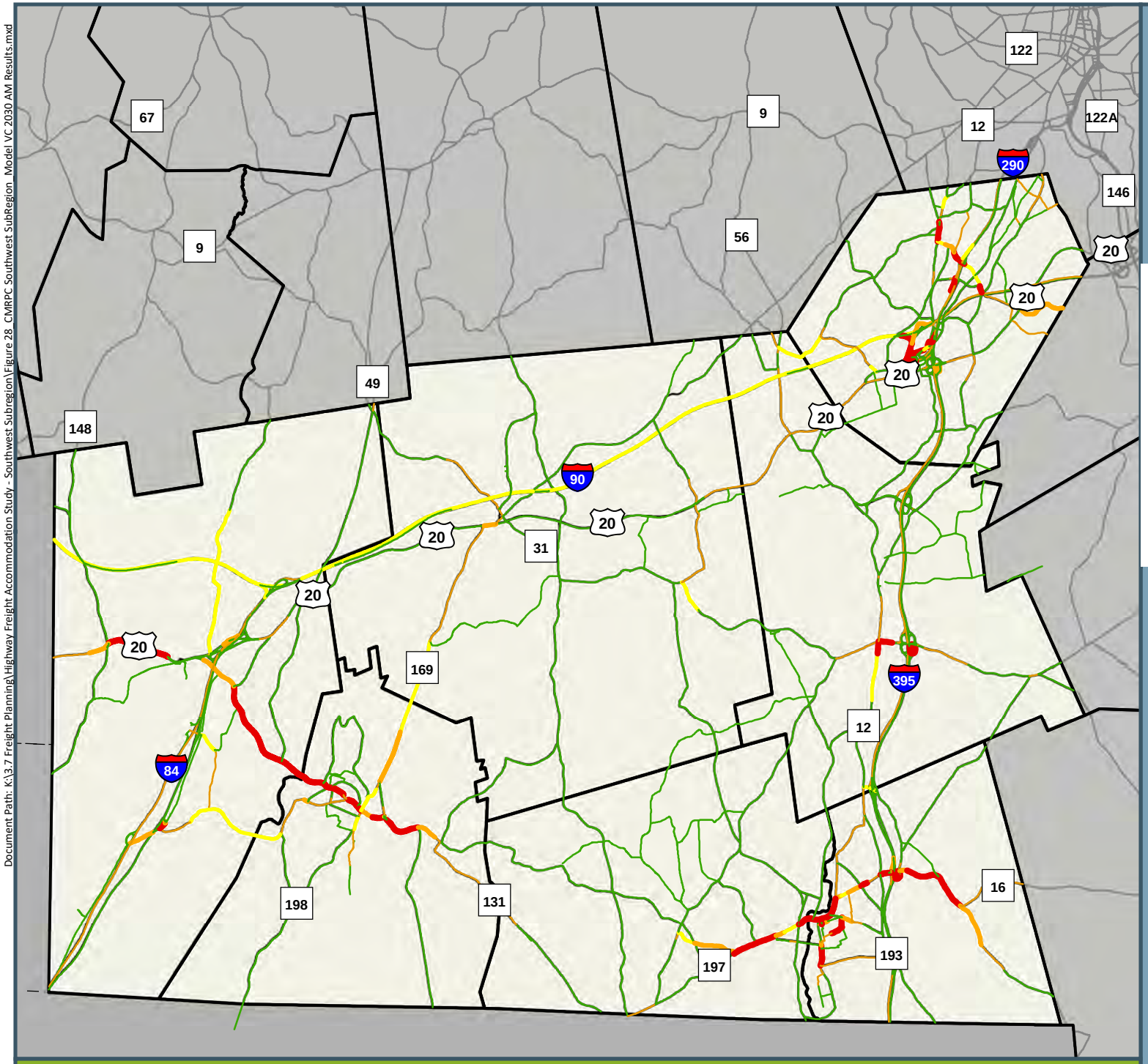
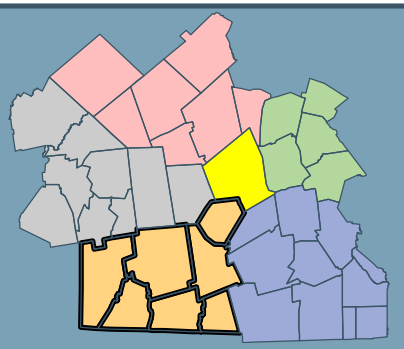
FIGURE 26 - SOUTHWEST SUBREGION EXISTING 2018 V/C RATIOS, PM PEAK PERIOD

Under the 2030 benchmark year scenario, shown in **Figures 27 & 28**, the Model results continue to indicate peak travel period V/C ratios greater than 0.80 in the town of Auburn along Oxford Street, Auburn Street and the Drury Square area and Route 12 near the interchange with I-90 (MassPike). Notably, the projected 2030 conditions also indicate an expansion, or "spill-over", of peak travel period congestion to other roadways, at times seemingly unattractive local streets, perhaps indicative of anticipated future year cut-through traffic. Elsewhere in the Southwest subregion, projected conditions in 2030 again indicate V/C ratios in excess of 0.80 in the Oxford town center area along Route 12, Sutton Avenue and the I-395 interchange area. In the host communities of Southbridge and Sturbridge, the Route 131 corridor, between US Route 20 and downtown Southbridge exhibits the "spill-over" of V/C ratios greater than 0.80 during both peak travel periods, indicative of anticipated future year cut-through traffic. Further, the Route 20 commercial area in Sturbridge indicates future year reoccurring congestion with peak travel period V/C ratios in excess of 0.80. Similarly, Route 16, Route 193 and Route 197 in the host communities of Dudley and Webster exhibit congested travel conditions in both the AM and PM peak periods along with a projected expansion of roadways with V/C ratios in excess of 0.80. This is indicative of the potential increased usage of seemingly unattractive local roads to avoid known, reoccurring congestion.





Legend

2030 VC Ratios_AM

- 0.00 - 0.40
- 0.41 - 0.60
- 0.61 - 0.70
- 0.71 - 0.80
- > 0.80
- Southwest Subregion Towns

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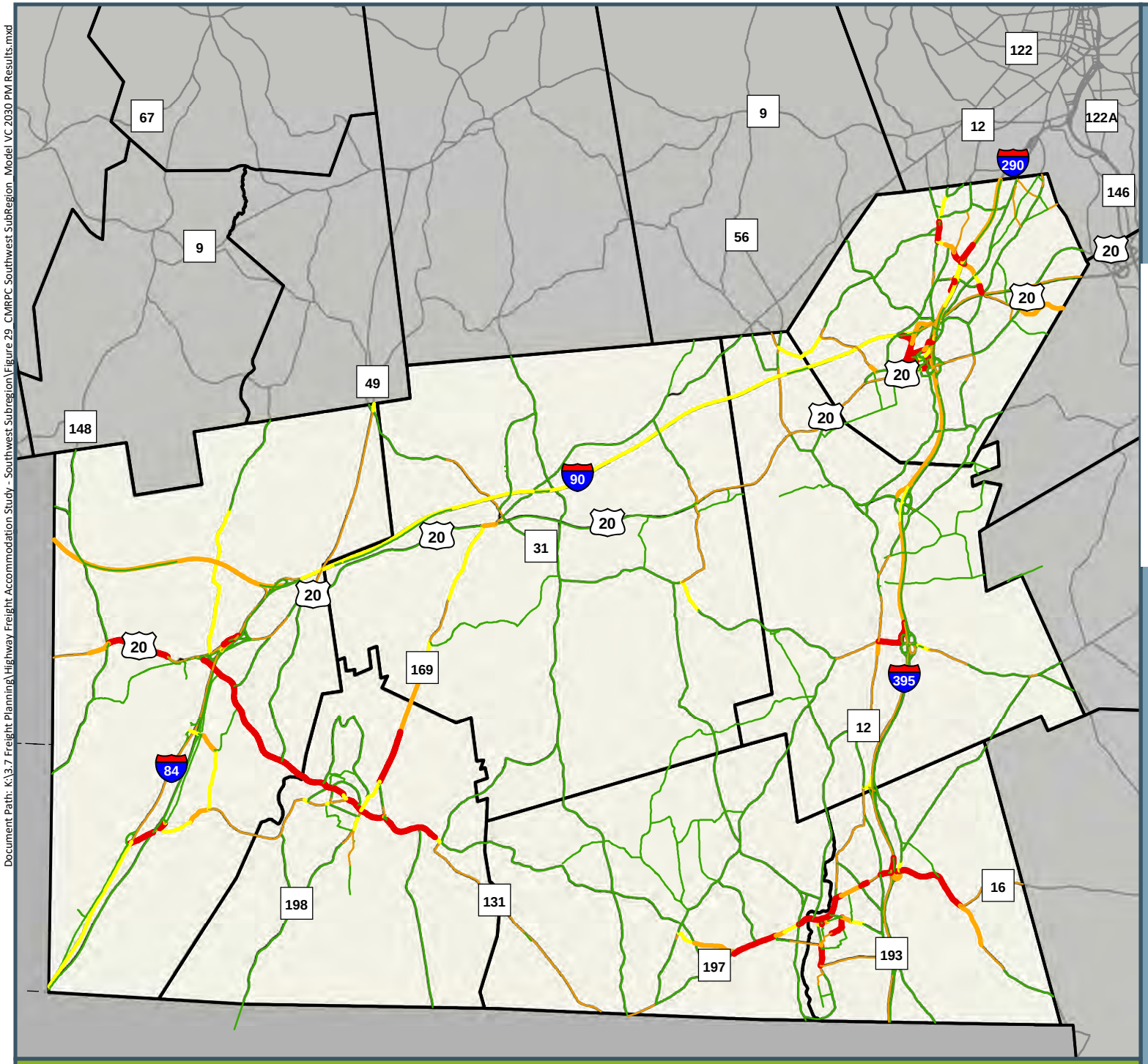
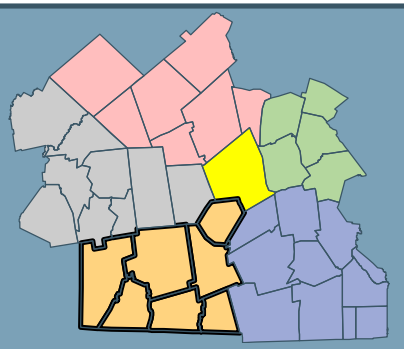
FIGURE 27 - SOUTHWEST SUBREGION PROJECTED 2030 V/C RATIOS, AM PEAK PERIOD





Legend

2030 VC Ratios_PM

- 0.00 - 0.40
- 0.41 - 0.60
- 0.61 - 0.70
- 0.71 - 0.80
- > 0.80
- **Southwest Subregion Towns**

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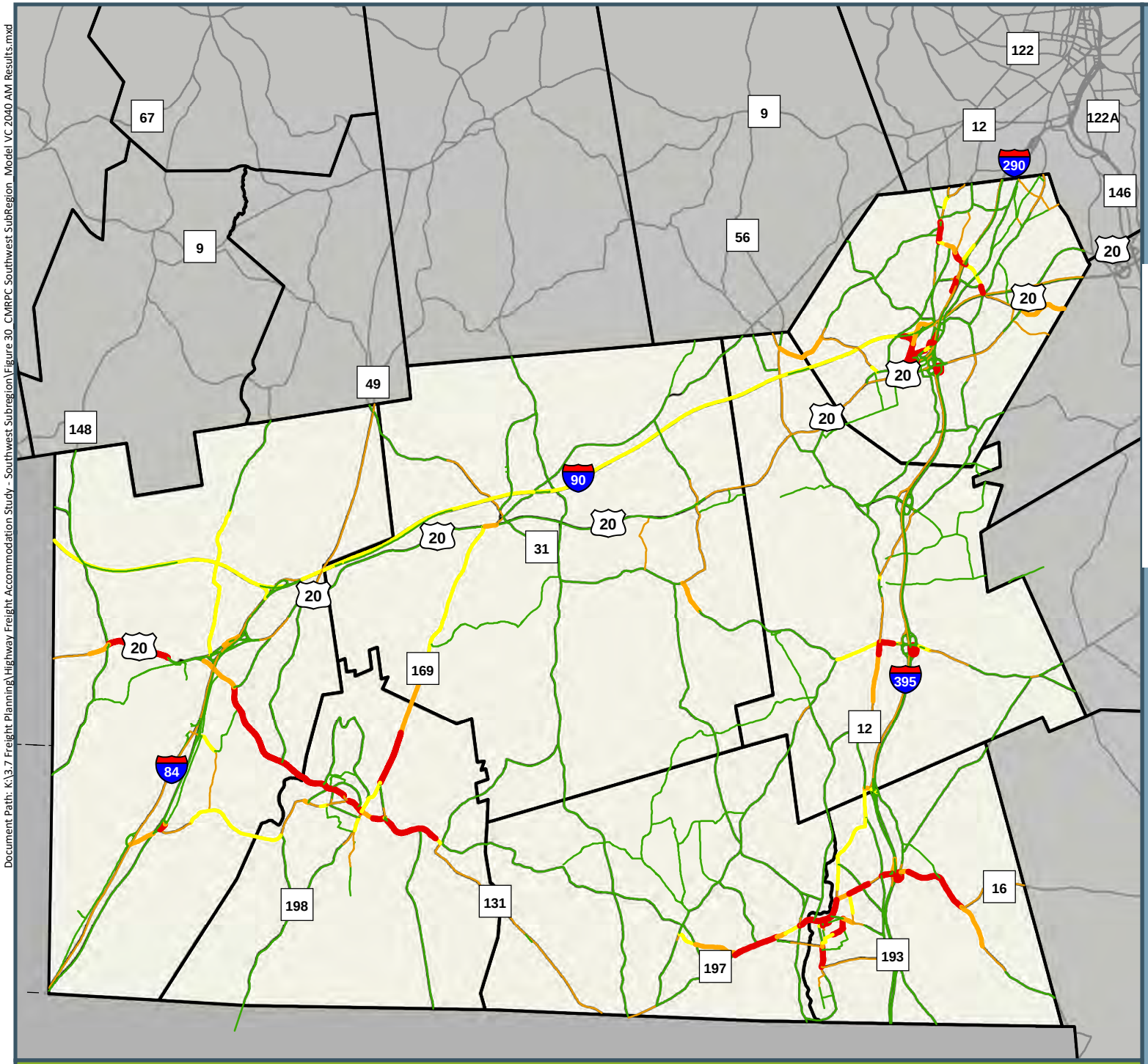
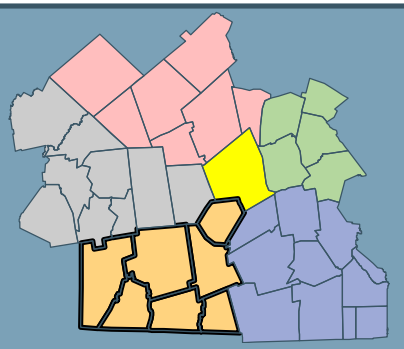
FIGURE 28 - SOUTHWEST SUBREGION PROJECTED 2030 V/C RATIOS, PM PEAK PERIOD

Under the projected 2040 scenario, shown in **Figures 29 & 30**, essentially the same highway corridors in the Southwest planning subregion identified above continue to experience V/C ratios in excess of 0.80. Throughout the Southwest subregion's highway network during both projected 2040 peak travel periods, calculated V/C ratios rise relative to the modest increases in traffic volumes anticipated between 2030 and 2040 at the present time. Congested conditions are anticipated to spread, but to a lesser extent than in the previous decade. Elsewhere, under the projected 2040 evening peak travel period, V/C ratios are observed to increase on segments of I-290 and I-395 in Auburn and I-395 in Oxford. This is indicative of the anticipated future growth in greater-region traffic volumes as well as reaffirming the importance of the Interstate System serving the central Massachusetts planning region.





Legend

2040 VC Ratios_AM

- 0.00 - 0.40
- 0.41 - 0.60
- 0.61 - 0.70
- 0.71 - 0.80
- > 0.80
- **Southwest Subregion Towns**

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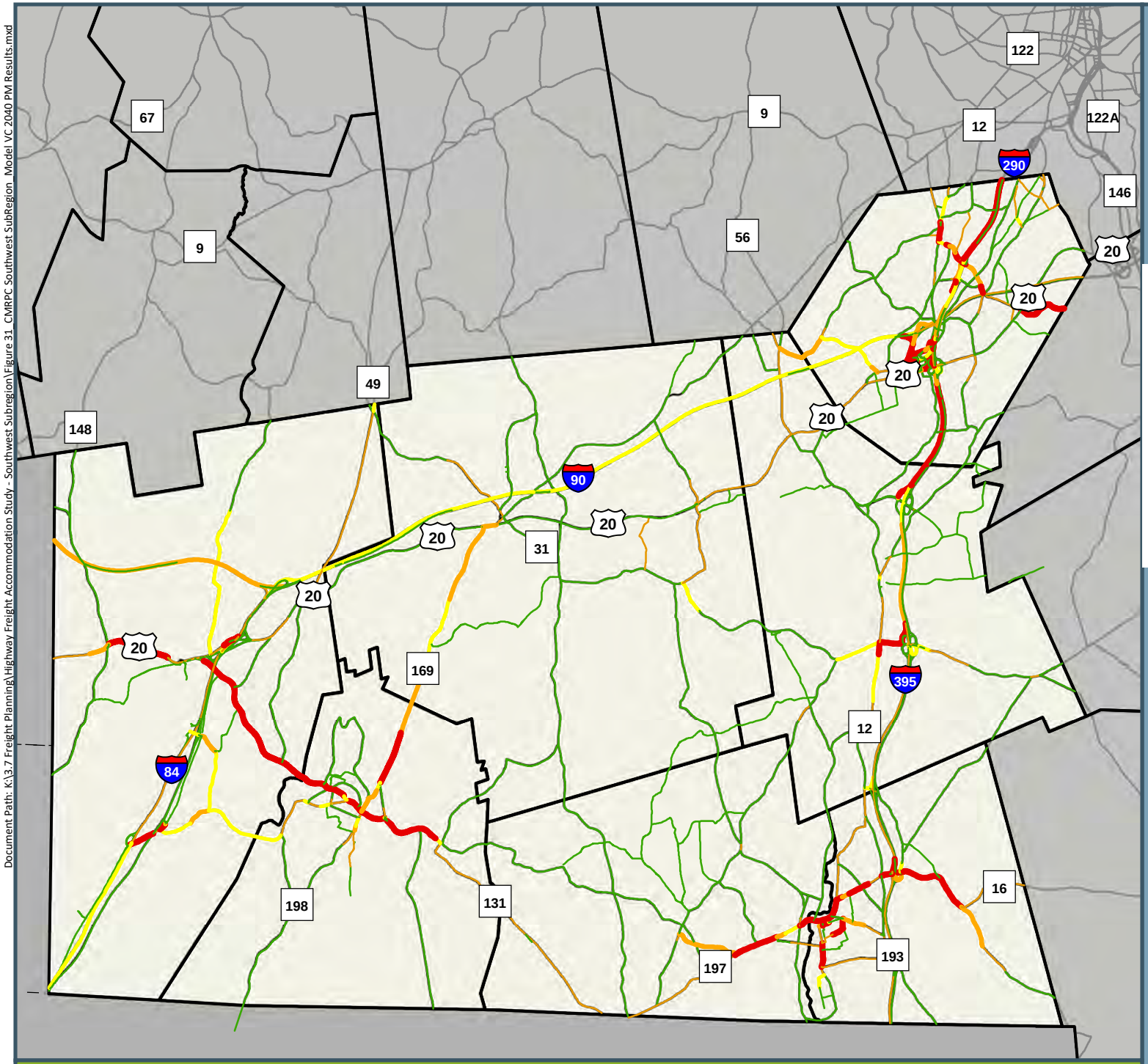
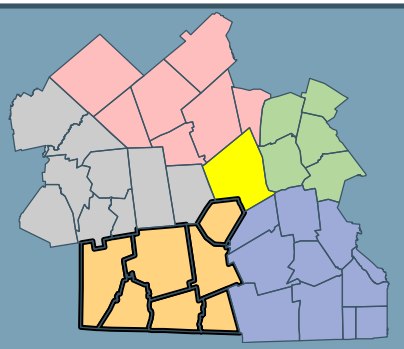
FIGURE 29 - SOUTHWEST SUBREGION PROJECTED 2040 V/C RATIOS, AM PEAK PERIOD





Legend

2040 VC Ratios_PM

- 0.00 - 0.40
- 0.41 - 0.60
- 0.61 - 0.70
- 0.71 - 0.80
- > 0.80
- **Southwest Subregion Towns**

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FIGURE 30 - SOUTHWEST SUBREGION PROJECTED 2040 V/C RATIOS, PM PEAK PERIOD

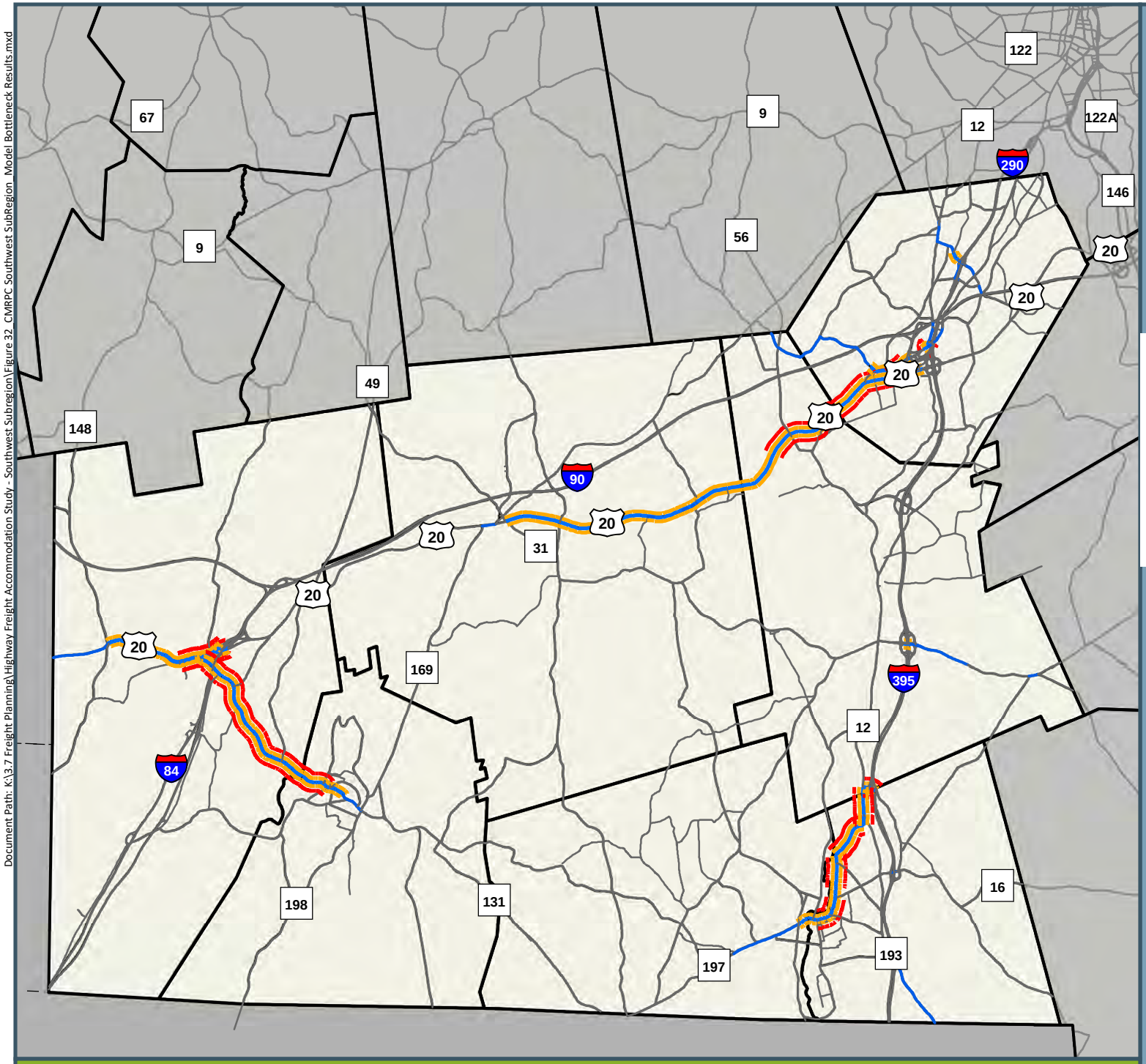
Potential Highway "Bottleneck" Segments in the Southwest Subregion

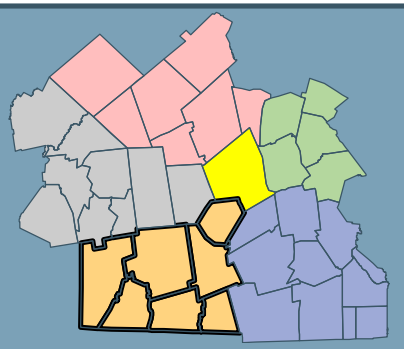
The Travel Demand Forecasting Model software, or "Model", was also used to identify potential "Bottleneck" segments on the Southwest subregion's federal-aid highways and other major locally-maintained roads. This analysis is based on the number of "Origin/Destination" (O/D) pairs using the highway network. The "Origin" is the location of the beginning of a vehicle trip. The "Destination" is the location of the end of the vehicle trip. This particular analysis is customized to the CMRPC region's Model which has a definitive number of calculated O/D pairs: 837,225. In a relative sense, Models for larger planning areas would have more O/D pairs, such as the greater Boston region. Conversely, smaller planning regions would have fewer O/D pairs, such as Franklin County in western Massachusetts.

Three (3) Scenarios were analyzed: "Stage 1", "Stage 2" & "Stage 3". The "Stage 1" Scenario Model results indicate where there are over 5,000 O/D pairs estimated to be using a particular segment of highway in the suburban and fairly rural Southwest subregion. Under the "Stage 2" Scenario, Model results identify where there are over 7,500 O/D pairs using a particular highway segment in the Southwest subregion. Finally, a "Stage 3" Scenario shows where there are in excess of 10,000 O/D pairs using the major federal-aid highways in the Southwest planning subregion.

The results of the three (3) analyzed Scenarios are shown on **Figure 31**. The figure shows *potential* Model-derived highway Bottleneck segments in the Southwest planning subregion. The identified potential Bottleneck segments affect all traffic using the highway network, including the range of heavy vehicles transporting a wide array of freight. The major highways in the Southwest subregion highlighted by the Model analysis include US Route 20 from I-395 in Auburn, through Oxford and ultimately diminishing at Charlton City only again to show a Stage 3 attractiveness level west of I-84 in the host community of Sturbridge. Route 131 similarly exhibits a high attractiveness level from US Route 20 in Sturbridge, eventually diminishing in the downtown Southbridge area. Lastly, Route 12 in the town of Webster from the Oxford town line to the Route 16 corridor also exhibits a Stage 3 level of O/D pairs.

As such, travel conditions in the Southwest planning subregion on US Route 20 and State Numbered Routes 12 and 131 need to be monitored on a continued, periodic basis to verify Model results based on observed conditions in the field. Analytical estimates often need to be verified, perhaps through Travel Time & Delay studies conducted by a survey vehicle during both peak and off-peak travel periods, for comparison purposes. If congestion based on roadway capacity constraints becomes apparent on an ongoing, reoccurring basis, then the consideration of improvements will become more apparent. Such improvements could be targeted towards those roadway segments experiencing regular, reoccurring congestion-related incidents, delays, etc. Again, all vehicles, including those heavy vehicles carrying freight, are impacted by the potentially sluggish projected travel conditions.





Legend

Southwest Subregion Towns

Bottleneck Locations

Stage 1: > 5,000 OD pairs

Stage 2: > 7,500 OD pairs

Stage 3: > 10,000 OD pairs

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FIGURE 31 - POTENTIAL HIGHWAY "BOTTLENECK" SEGMENTS IN THE SOUTHWEST SUBREGION

5.0 Summary of Findings

Table 13 contains a summary of findings extracted from the range of maps previously presented. The information is summarized by Southwest subregion host community and then by each State Numbered Route within the community. For some of the columns, as explained earlier, there was no sufficient data yet available. Further, some of the columns have multiple findings listed while other columns contain a range of findings such as overall traffic volumes as well as heavy vehicle volumes. The information within the table includes:

- Highway federal-aid eligibility
- Highway Ownership
- Regional Environmental Justice Plus (REJ+) Populations
- Critical Freight Corridor
- Transportation Improvement Program (TIP) Projects
- Traffic volume
- Heavy vehicle volume
- Heavy vehicle volume (northbound/eastbound)
- Heavy vehicle volume (southbound/westbound)
- Heavy vehicle percentage
- Average AM travel speeds
- Average PM travel speeds
- CMP Congested intersections
- Highway Safety Improvement Program (HSIP) crash clusters
- Pavement condition
- Bridges and culverts
- Management Systems data integration
- Environmental Profiles
- Evacuation Routes
- Hazardous Dams
- Locally-identified hazards and vulnerable infrastructure

The following are observations concerning each Southwest subregion host community that pertain to the above listed information categories:

Auburn

State Numbered Route 12 and US Route 20 are located in the town of Auburn. There is an REJ+ area of low-income population near US Route 20 and Interstate 395. There is a bridge project

programmed on the TIP in FFY 2025 to replace the US Route 20 bridge over I-395. The traffic volumes on the Route 12/US Route 20 combined section are 30,000 VPD. Route 12 traffic volumes range from 11,500 to 24,000 vpd while US Route 20 volumes are between 18,700 and 25,000 vpd. Approximately 16% of the observed daily traffic volumes on Route 12 are heavy vehicles. There is one (1) congested intersection on Route 12 at Swanson Road & Brotherton Way and one (1) HSIP crash cluster at US Route 20 & Millbury Street intersection. Regarding pavement condition, Route 12 has a small section of poor pavement, however most segments were observed to be either in fair or good condition. The pavement on US Route 20 was observed to be good to excellent condition. There are two (2) bridges along Route 12 and, on US Route 20, four (4) bridges, one (1) short span bridge, and one (1) major culvert. Two of the US Route 20 bridges are considered structurally deficient. Resulting from the Management Systems integration exercise, the entire length of Route 12 and the segment of Route 12/US Route 20 is considered "Tier 2" while one (1) segment on US Route 20 is "Tier 2". There is one (1) High Hazard dam and one (1) Significant Hazard dam is located near Route 12 while one (1) Significant Hazard dam is situated near US Route 20. Lastly, locally-identified vulnerable critical infrastructure and hazards are located near both Routes 12 and US Route 20 in the host community of Auburn.

Charlton

State Numbered Routes 31, 169, and US Route 20 are located in the town of Charlton. There are currently no REJ+ populations within the town of Charlton. Presently, there is a multi-year TIP highway improvement project programmed from FFYs 2022 to 2025 and currently underway on the section of US Route 20 between Richardson's Corner Road and the Auburn/Oxford Town Line. The highest daily traffic volumes observed in Charlton are found on US Route 20. There are no identified congested intersections, however there are four (4) HSIP crash clusters on US Route 20. Both US Route 20 and Route 31 were observed to have a mix of varying pavement conditions while Route 169 pavement was observed to be in good or excellent condition. There are three (3) bridges along US Route 20, three (3) bridges and three (3) major culverts along Route 31, and three (3) bridges along Route 169. Two (2) of the bridges are considered structurally deficient, one (1) each on both US Route 20 and Route 31. Resulting from the Management Systems integration exercise, one (1) "Tier 2" rated segment has been identified on both US Route 20 and Route 169. Also, there is one (1) Significant Hazard dam near US Route 20 and two (2) Significant Hazard dams situated near Route 31. Additionally, locally-identified vulnerable critical infrastructure is located near Routes 31 and 169 and US Route 20.

Dudley

In the town of Dudley, the State Numbered Routes are Route 12, Route 31, Route 131, and Route 197. There are REJ+ populations of low income along Route 131 on the western part of town and near Routes 12 and 197 near the Webster Town Line. There is a Route 131 bridge replacement project programmed for FFY 2025 on the TIP. Route 197 in Dudley has the highest daily traffic volumes while all four (4) State Numbered Routes have a daily percentage of heavy vehicles ranging between 6% and 8%. There are no known congested intersections in Dudley but there is one (1) HSIP crash cluster located at the Route 12/Brandon Road intersection . Pavement condition was observed in the field to be poor or excellent for Routes 12, 31, and 197 while the worst pavement conditions were seen along Route 131. There is one (1) bridge and two (2) major culverts on Route 12, one (1) structurally deficient bridge & two (2) culverts on Route 131, and one (1) short span bridge and two (2) culverts on Route 197. There are currently no "Tier 2" Management Systems integration exercise identified segments on the town's State Numbered Routes. There are both Significant & High Hazard dam structures nearby Routes 12 & 197 and one (1) Significant Hazard dam in the vicinity of Route 131. Lastly, there are locally-identified hazards and vulnerable infrastructure near each of the State Numbered Routes.

Oxford

State Numbered Routes 12 and 56 and US Route 20 are located in the town of Oxford. There are an Identified REJ+ populations of Limited English Proficiency (LEP) and low-income near Route 12 in the center and southern part of the town. Presently, there is a multi-year TIP highway improvement project programmed from FFYs 2022 to 2025 for the entire length of US Route 20 in Oxford. There is also a bridge replacement project on Route 56 programmed in the TIP for FFY 2027. The highest observed daily traffic volumes in this host community are on US Route 20, with over 20,000 vpd. Regarding daily heavy vehicles, there are 5% on Route 12 and 10% on Route 56. However, at this time, there is no current heavy vehicle data available for US Route 20. The US Route 20/Route 56 intersection in Oxford is an identified HSIP crash cluster. There is a mix of pavement condition on State Numbered Routes 12 and 56 and US Route 20 with a few observed segments of poor pavement. There are four (4) short span bridges along Route 12, two (2) of which are structurally deficient. Additionally, there is one (1) bridge and one (1) major culvert along Route 12 and two (2) bridges along Route 56. Resulting from the Management Systems integration exercise, two (2) "Tier 2" segments have been identified on Routes 12 and 56 and US Route 20. Also, Routes 12 and 56 have nearby Significant Hazard dams while both Route 12 and US Route 20 have nearby locally-identified hazards.

Southbridge

In the town of Southbridge, the State Numbered Routes are Route 131, Route 169, and Route 198. All State Numbered Routes are within an REJ+ population of either low-income or minority. There is a TIP resurfacing project on Route 131 currently programmed for FFY 2027. Both Routes 131 and 169 accommodate the highest daily traffic volumes in Southbridge with between 7% to 10% heavy vehicles. There are no known congested intersections or HSIP crash clusters located on all three (3) Routes. It was observed that Route 131 exhibits either fair or good pavement conditions while Route 198 has good to excellent pavement condition. As for Route 169, it was observed to have a mix of pavement conditions ranging between poor and excellent. Route 131 has two (2) bridges, Route 169 has one (1) bridge & one (1) major culvert while Route 198 has two (2) short span bridges. Resulting from the Management Systems integration exercise, there is one (1) identified "Tier 2" rated segment on Route 131. Lastly, there are hazardous dams near all three (3) State Numbered routes, ranging from Low to High Hazard.

Sturbridge

State Numbered Routes 49, 131, 148, and US Route 20 are located in the host community of Sturbridge. There are currently no identified REJ+ populations within the town of Sturbridge. Route 49 in Sturbridge is considered a Critical Rural Freight Corridor. There are highway improvement projects currently programmed in both FFY 2026 & 2027 of the TIP for US Route 20, Route 49, and Route 131. The highest observed daily traffic volumes are on US Route 20 while the highest observed daily percentage of heavy vehicles are using Route 49, with a total of 13%. There are no identified congested intersections, however the US Route 20/Route 131 intersection exhibits the most vehicle delays. There is at least one (1) HSIP crash cluster located on Route 49, Route 131, and US Route 20. The only poor pavement segments were observed on US Route 20, while the three (3) State Numbered Routes had a mix of pavement conditions. There are four (4) bridges & one (1) major culvert on US Route 20, one (1) bridge & two (2) major culverts on Route 49, and one (1) bridge on Route 131. Resulting from the Management Systems integration exercise, there are two (2) "Tier 2" segments each on both US Route 20 and Route 131 and one (1) "Tier 2" segment identified on Route 148. There are Significant Hazard dams near US Route 20 and Route 148. Additionally, locally-identified hazards and vulnerable critical infrastructure are nearby to all State Numbered Routes 49, 131, 148, and US Route 20.

Webster

In the town of Webster, the State Numbered Routes are Route 12, Route 16, and Route 193. There is an REJ+ population of low-income near Route 12 and a small portion of Route 16.

There is a TIP intersection improvement project on Route 16 at the I-395 interchange currently programmed for FFY 2025. There are in excess of 10,000 vpd on each of the State Numbered Routes with heavy vehicles ranging from 5% to 8%. There is one (1) identified congested intersection on Route 16 at Sutton Road and the northbound I-395 ramps and three (3) HSIP crash clusters on the State Numbered Routes in the town of Webster. Regarding pavement, Route 12 was observed to be mostly in good condition except for one (1) segment in very poor condition. Route 16 has a mix of pavement conditions between poor and good while Route 193 pavement ranges from fair to excellent condition. Route 12 has one (1) short span bridge and Route 16 has one (1) bridge and one (1) short span bridge. According to the results of the Management Systems integration exercise, there are two (2) "Tier 2" segments on Route 12 while one (1) segment was identified on both Route 16 and Route 193. There are multiple Significant Hazard dams in proximity to Route 16. Lastly, there is locally-identified vulnerable critical infrastructure in Webster that is near all three (3) State Numbered Routes and, in addition, hazards near Route 12.

Table 13 - Summary of Findings

Host Community	Route #	Fed-Aid Eligible	Highway Ownership	REJ+ Populations	Critical Freight Corridor	TIP Projects	Traffic Volume	Heavy Vehicle Volume	Heavy Vehicle Volume (NB/EB)	Heavy Vehicle Volume (SB/WB)	Heavy Vehicle %	Average Travel Speeds (AM)	Average Travel Speeds (PM)	CMP Congested Intersections	HSIP Crash Clusters	Pavement Condition	Bridges & Culverts	Management Systems Data Integration	Environmental Profiles	Evacuation Route	Dams	Locally-Identified Hazards & Vulnerable Infrastructure
Auburn	12	Yes	MassDOT	No	No	No	11,500 - 24,000	1,840	960	880	16%	20 - 43 MPH	34 - 41 MPH	Yes	No	Poor / Fair / Good / Excellent	2 Bridges	Tier 2	Nearby recreation & water suppy protection areas, wetlands, potential vernal pools, rare species habitat, and 100 & 500 year flood zones.	Primary	Nearby Significant & High Hazard Dams	Nearby Hazards & Vulnerable Critical Infrastructure
	20	Yes	MassDOT	Yes	No	Yes	18,700 - 25,300	No Data	No Data	No Data	No Data	30 - 41 MPH	23 - 46 MPH	No	Yes	Good / Excellent	4 Bridges (2SD), 1 Short Span Bridge, 1 Culvert	Tiers 2 & 3	Nearby recreation area, wetlands, potential vernal pools, and 100 & 500 year flood zones.	Primary	Nearby Significant Hazard Dam	Nearby Hazards & Vulnerable Critical Infrastructure
	12/20	Yes	MassDOT	No	No	No	30,900	No Data	No Data	No Data	No Data	33 - 41 MPH	28 - 36 MPH	No	No	Excellent	None	Tier 2	Nearby wetlands & potential vernal pools.	Primary	None	Nearby Hazards
Charlton	20	Yes	MassDOT	No	No	Yes	15,000 - 25,400	No Data	No Data	No Data	No Data	20 - 53 MPH	21 - 51 MPH	No	Yes	Poor / Fair / Good	2 Bridges (1SD), 1 Short Span Bridge	Tiers 2 & 3	Nearby open space, wetlands, vernal and potential vernal pools, rare species habitat, and 100 & 500 year flood zones.	Primary	Nearby Significant Hazard Dam	Nearby Vulnerable Critical Infrastructure
	31	Yes	Town	No	No	No	2,800 - 10,800	165 - 220	79 - 105	86 - 115	5% - 6%	15 - 39 MPH	19 - 42 MPH	No	Yes	Poor / Good / Excellent	1 Bridge, 2 Short Span Bridges (1SD), 3 Culverts	Tier 3	Nearby recreation area, wetlands, potential vernal pools, and 100 & 500 year flood zones.	Primary & Secondary	Nearby Significant Hazard Dams	Nearby Hazards & Vulnerable Critical Infrastructure
	169	Yes	MassDOT	No	No	No	11,100 - 11,400	No Data	No Data	No Data	No Data	No Data	No Data	No	Yes	Good / Excellent	3 Bridges	Tiers 2 & 3	Nearby recreation area, wetlands, vernal and potential vernal pools, rare species habitat, and 100 & 500 year flood zones.	Primary	None	Nearby Hazards & Vulnerable Critical Infrastructure
Dudley	12	Yes	MassDOT & Town	Yes	No	No	2,200 - 13,900	130 - 305	75 - 182	55 - 123	6% - 7%	No Data	No Data	No	Yes	Poor / Excellent	1 Bridge, 2 Culverts	Tier 3	Nearby water supply protection area, wetlands, potential vernal pools, rare species habitat, and 100 & 500 year flood zones.	Primary	Nearby Significant & High Hazard Dams	Nearby Hazards & Vulnerable Critical Infrastructure
	31	Yes	Town	No	No	No	900 - 2,800	165	79	86	6%	No Data	No Data	No	No	Poor / Good / Excellent	None	Tier 3	Nearby open space, wetlands, potential vernal pools, rare species habitat, and 500 year flood zones.	Primary	None	Nearby Hazards & Vulnerable Critical Infrastructure
	131	Yes	MassDOT	Yes	No	Yes	8,750 - 9,125	570 - 600	290 - 310	280 - 290	6% - 7%	No Data	No Data	No	No	Very Poor / Poor / Fair	1 Bridge (SD), 2 Culverts	Tier 3	Nearby wetlands, vernal & potential vernal pools, rare species habitat, and 100 & 500 year flood zones.	Primary	Nearby Significant Hazard Dam	Nearby Vulnerable Critical Infrastructure
	197	Yes	MassDOT	Yes	No	No	9,300 - 15,750	670 - 755	360 - 364	310 - 391	7% - 8%	No Data	No Data	No	No	Poor / Excellent	1 Short Span Bridge, 2 Culverts	Tier 3	Nearby recreation & open space areas, wetlands, potential vernal pools, and 100 & 500 year flood zones.	Primary	Nearby Significant & High Hazard Dams	Nearby Hazards & Vulnerable Critical Infrastructure
Oxford	12	Yes	MassDOT & Town	Yes	No	No	7,400 - 15,800	375	177	198	5%	30 - 39 MPH	28 - 38 MPH	No	No	Poor / Fair / Good / Excellent	4 Short Span Bridges (2SD)	Tiers 2 & 3	Nearby open space area, wetlands, vernal and potential vernal pools, rare species habitat, and 100 & 500 year flood zones.	Primary	Nearby Significant Hazard Dams	Nearby Hazards & Vulnerable Critical Infrastructure
	20	Yes	MassDOT	No	No	Yes	19,650 - 25,400	No Data	No Data	No Data	No Data	31 - 53 MPH	25 - 54 MPH	No	Yes	Fair / Good / Excellent	1 Bridge, 1 Culvert	Tiers 2 & 3	Nearby wetlands, potential vernal pools, and 100 & 500 year flood zones.	Primary	None	Nearby Hazards
	56	Yes	Town	No	No	Yes	7,200 - 12,700	720 - 805	350 - 395	370 - 410	10%	23 - 41 MPH	22 - 41 MPH	No	Yes	Fair / Poor / Excellent	2 Bridges (1SD)	Tiers 2 & 3	Nearby wetlands, vernal & potential vernal pools, and 100 & 500 year flood zones.	Primary	Nearby Significant Hazard Dam	None
Southbridge	131	Yes	MassDOT & Town	Yes	No	Yes	8,750 - 14,700	600	310	290	7%	9 - 36 MPH	7 - 38 MPH	No	No	Fair / Good	2 Bridges	Ties 2 & 3	Nearby recreation area, wetlands, potential vernal pools, rare species habitat, and 100 & 500 year flood zones.	Primary	Nearby Significant & High Hazard Dams	No Data
	169	Yes	MassDOT & Town	Yes	No	No	2,000 - 11,100	100 - 760	40 - 530	60 - 230	8% - 10%	No Data	No Data	No	No	Poor / Fair / Good / Excellent	1 Bridge, 1 Culvert	Tier 3	Nearby recreation/conservation & open space areas, wetlands, vernal and potential vernal pools, rare species habitat, and 100 & 500 year flood zones.	Primary	Nearby Significant Hazard Dams	No Data
	198	Yes	Town	Yes	No	No	1,075 - 6,875	No Data	No Data	No Data	No Data	No Data	No Data	No	No	Good / Excellent	2 Short Span Bridges	Tier 3	Nearby recreation, conservation, water supply protenction & open space areas, wetlands, vernal and potential vernal pools, rare species habitat, and 100 & 500 year flood zones.	Secondary	Nearby Low Hazard Dams	No Data
	131/169	Yes	Town	Yes	No	No	17,800	1,850	840	1,010	10%	32 MPH	30 - 32 MPH	No	No	Good / Excellent	None	Tier 3	Nearby wetlands and 100 & 500 year flood zones.	Primary	Nearby Significant & High Hazard Dams	No Data

Table 13 - Summary of Findings

Host Community	Route #	Fed-Aid Eligible	Highway Ownership	REJ+ Populations	Critical Freight Corridor	TIP Projects	Traffic Volume	Heavy Vehicle Volume	Heavy Vehicle Volume (NB/EB)	Heavy Vehicle Volume (SB/WB)	Heavy Vehicle %	Average Travel Speeds (AM)	Average Travel Speeds (PM)	CMP Congested Intersections	HSIP Crash Clusters	Pavement Condition	Bridges & Culverts	Management Systems Data Integration	Environmental Profiles	Evacuation Route	Dams	Locally-Identified Hazards & Vulnerable Infrastructure
Sturbridge	20	Yes	MassDOT	Yes	No	Yes	8,850 - 22,600	740 - 1,840	380 - 775	360 - 1,065	8% - 11%	19 - 32 MPH	13 - 29 MPH	No	Yes	Poor / Fair / Good / Excellent	2 Bridges, 2 Short Span Bridges, 1 Culvert	Tiers 2 & 3	Nearby recreation/conservation, open space, and water supply protection areas, wetlands, vernal and potential vernal pools, rare species habitat, and 100 & 500 year flood zones.	Primary	Nearby Significant Hazard Dams	Nearby Hazards & Vulnerable Critical Infrastructure
	49	Yes	MassDOT	No	Yes	Yes	6,000 - 7,200	970	460	510	13%	No Data	No Data	No	Yes	Good / Excellent	1 Bridge, 2 Culverts	Tier 3	Nearby recreation/conservation and open space area, wetlands, potential vernal pools, and 100 & 500 year flood zones.	Primary	None	Nearby Hazards & Vulnerable Critical Infrastructure
	131	Yes	MassDOT	No	No	Yes	14,000 - 17,875	930	480	450	7%	No Data	No Data	No	Yes	Fair / Good	1 Bridge	Tiers 2 & 3	Nearby recreation and open space area, wetlands, potential vernal pools, rare species habitat, and 100 & 500 year flood zones.	Primary	None	Nearby Hazards & Vulnerable Critical Infrastructure
	148	Yes	Town	No	No	No	2,900 - 6,475	240	115	125	8%	No Data	No Data	No	No	Fair / Good / Excellent	None	Tiers 2 & 3	Nearby recreation and open space area, wetlands, vernal and potential vernal pools, rare species habitat, and 100 & 500 year flood zones.	Primary	Nearby Significant Hazard Dams	Nearby Hazards & Vulnerable Critical Infrastructure
Webster	12	Yes	MassDOT & Town	Yes	No	No	8,675 - 20,750	470 - 630	235 - 340	235 - 290	5%	12 - 34 MPH	7 - 36 MPH	No	Yes	Very Poor / Good	1 Short Span Bridge	Tiers 2 & 3	Nearby wetlands, potential vernal pools, rare species habitat, and 100 & 500 year flood zones.	Primary	None	Nearby Hazards & Vulnerable Critical Infrastructure
	16	Yes	Town	Yes	No	Yes	6,325 - 18,550	No Data	No Data	No Data	No Data	33 - 42 MPH	33 - 43 MPH	Yes	Yes	Poor / Fair / Good	1 Bridge, 1 Short Span Bridge	Tiers 2 & 3	Nearby conservation, recreation and open space area, wetlands, vernal and potential vernal pools, rare species habitat, and 100 & 500 year flood zones.	Primary	Nearby Significant Hazard Dams	Nearby Vulnerable Critical Infrastructure
	193	Yes	MassDOT & Town	No	No	No	4,625 - 12,200	365	145	220	8%	22 - 40 MPH	22 - 40 MPH	No	Yes	Fair / Good / Excellent	None	Tiers 2 & 3	Nearby recreation and water supply protection area, wetlands, vernal and potential vernal pools, and 100 & 500 year flood zones.	Secondary	None	Nearby Vulnerable Critical Infrastructure

6.0 Suggested Improvement Options

Based on the previous Summary of Findings section, a number of suggested improvement options have been compiled for consideration by both MassDOT and the seven (7) host communities in the Southwest planning subregion. The following **Figure 32** shows suggested priority infrastructure improvements for each of the towns. Highway segments that are on the federal-aid network are eligible for potential future-year project funding through the CMMPO's TIP. Other available improvement funding resources also have the potential to be applied, such as various grant opportunities and state-provided Chapter 90 funds.

6.1 Southwest Subregion-Wide Improvement Options

- In the spirit of Jason's Law, contemplate revised local policy and strongly consider truck parking-friendly bylaws that allow for federally required driver rest periods for long distance truckers at key commercial and/or industrial locations in each of the host communities.
- Potential improvement of truck turning radii at major intersections, limited box widening where necessary, the installation of truck climbing lanes on steep grades as well as the elimination of hazardous highway curves.
- Check and optimize traffic signal timing & phasing at high-volume signalized intersections.
- Maintain all pavement to a condition of "Good" or above. Pavement conditions are especially critical on established Critical Freight Corridors and State Numbered Routes.
- Address all structurally deficient (SD) bridges. Address those bridges with posted weight limits associated with reduced load-carrying capabilities.
- Numerous culverts need attention in the Southwest transportation planning subregion. As such, commence corridor-wide and/or town-wide culvert assessment programs that can allow for the future targeted replacement of key vulnerable drainage system components. *(The CMRPC transportation staff is available to discuss this program further.)*
- Improve/repair the hazardous dams identified in the Southwest subregion, especially those located upstream of State Numbered Routes.

6.2 Southwest Subregion Host Community Improvement Options

Auburn

- Consider improving the Significant & High Hazard dams in the community in proximity to Route 12 and US Route 20.
- Improve the poor pavement segments identified on Route 12, just north of US Route 20.

- Consider improving the Management Systems integration exercise-identified Tier 2 priority segments on Route 12 and US Route 20.
- Improve the two (2) structurally deficient bridges on US Route 20 over I-395. These bridges are currently programmed for replacement in FFY 2025 of the CMMPO's TIP.
- Improve the HSIP crash cluster at the intersection of US Route 20 with Millbury Street.
- Consider any nearby locally-identified hazards and vulnerable critical infrastructure that could potentially be impacted by the suggested subregion-wide improvement options.

Charlton

- Improve the poor pavement segments identified on Route 31 and US Route 20.
- Consider improving the Management Systems data integration exercise-identified Tier 2 priority segments on US Route 20 and Route 169.
- Consider improving all Significant Hazard dams in the community, specifically near and upstream of both US Route 20 and Route 31.
- Improve the four (4) identified HSIP intersection crash clusters in Charlton.
- Improve the two (2) structurally-deficient bridges on Route 20 and Route 31 over Cady Brook.
- Consider any nearby locally-identified hazards and vulnerable critical infrastructure that could potentially be impacted by the suggested subregion-wide improvement options.

Dudley

- Improve the poor and very poor pavement segments identified on all four (4) State Numbered Routes.
- Consider improving all Significant & High Hazard dams in the community, specifically near and upstream of Route 12, Route 131, and Route 197.
- Improve the identified HSIP crash clusters at the Route 12 & Brandon Road intersection.
- Improve the structurally deficient bridge on Route 131 over the Quinebaug River. A bridge replacement project for this structure is currently programmed in FFY 2025 of the TIP.
- Consider any nearby locally-identified hazards and vulnerable critical infrastructure that could potentially be impacted by the suggested subregion-wide improvement options.

Oxford

- Improve the poor pavement segments identified on Route 12 and Route 56.
- Improve the structurally deficient bridges on Route 12 over Lowes Brook and on Route 56 over the French River. The Route 56 bridge over the French River is currently programmed for replacement in FFY 2027 of the CMMPO's TIP.

- Consider improving the Management Systems data integration exercise-identified Tier 2 priority segments on Route 12, Route 56, and US Route 20.
- Improve the identified HSIP crash cluster at the US Route 20/Route 56 intersection. This Oxford intersection will be improved as part of the US Route 20 highway reconstruction project now underway. And programmed on the TIP for FFY 2022 through 2025.
- Consider improving all Significant Hazard dams in the town of Oxford, specifically near Route 12 and Route 56.
- Consider any nearby locally-identified hazards and vulnerable critical infrastructure that could potentially be impacted by the suggested subregion-wide improvement options.

Southbridge

- Improve the poor pavement segments identified on the Mechanic Street section of Route 169 in Southbridge.
- Consider improving the Management Systems data integration exercise-identified Tier 2 priority segment on Route 131, between Hamilton Street and Route 169.
- Consider improving all Significant & High Hazard dams in the community, specifically near Route 131 and Route 169.
- Consider any nearby locally-identified hazards and vulnerable critical infrastructure that could potentially be impacted by the suggested subregion-wide improvement options.

Sturbridge

- Improve the poor pavement segment identified on US Route 20, between Route 148 and Route 131 through the community's commercially oriented area.
- Consider improving the Management Systems data integration exercise-identified Tier 2 priority segments on US Route 20, Route 131, and Route 148.
- Improve the five (5) identified HSIP crash clusters located on US Route 20, Route 49, and Route 131. The HSIP location at the Route 49 intersection with Putnam Road is currently programmed for FFY 2027 of the CMMPO's TIP.
- Consider improving all Significant Hazard dams in the community, in particular near US Route 20 and Route 148.
- Consider any nearby locally-identified hazards and vulnerable critical infrastructure that could potentially be impacted by the suggested subregion-wide improvement options.

Webster

- Improve the very poor pavement segment identified on Route 12, south of the Oxford town line. Also, improve the poor pavement segment on Route 16, just east of I-395.
- Improve the three (3) identified HSIP crash clusters along the State Numbered Routes in the town of Webster. The intersection of Route 16/Sutton Avenue will be improved as part of a project currently programmed in FFY 2025 of the TIP.
- Consider improving the Management Systems data integration exercise-identified Tier 2 priority segments on all three (3) State Numbered Routes serving the town of Webster.
- Consider improving all Significant Hazard dams in the community, in particular near Route 16.
- Consider any nearby locally-identified hazards and vulnerable critical infrastructure that could potentially be impacted by the suggested subregion-wide improvement options.

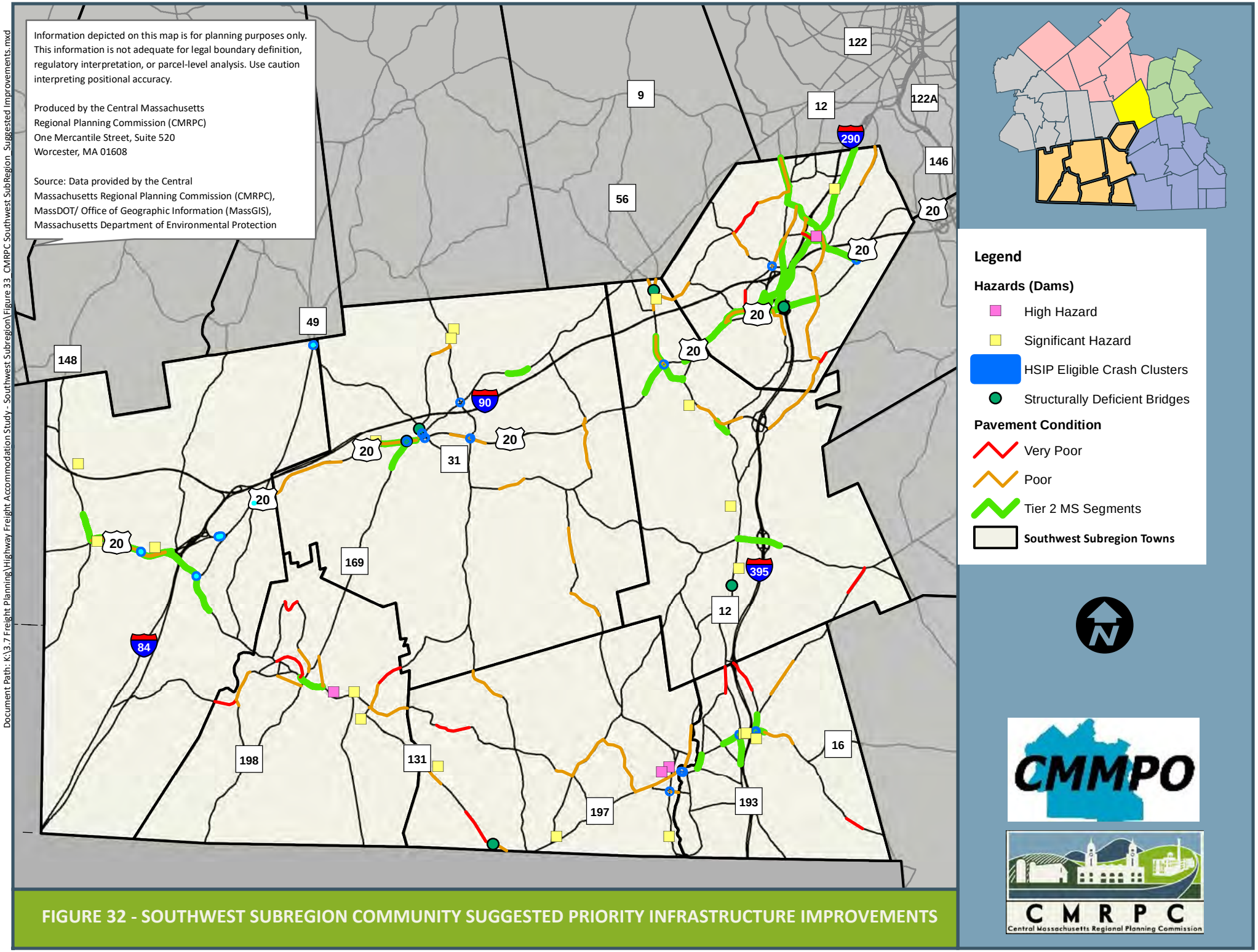

FIGURE 32 - SOUTHWEST SUBREGION COMMUNITY SUGGESTED PRIORITY INFRASTRUCTURE IMPROVEMENTS

Central Massachusetts Regional Planning Commission

Member Communities

Auburn	Northborough
Barre	Northbridge
Berlin	Oakham
Blackstone	Oxford
Boylston	Paxton
Brookfield	Princeton
Charlton	Rutland
Douglas	Shrewsbury
Dudley	Southbridge
East Brookfield	Spencer
Grafton	Sturbridge
Hardwick	Sutton
Holden	Upton
Hopedale	Uxbridge
Leicester	Warren
Mendon	Webster
Millbury	West Boylston
Millville	West Brookfield
New Braintree	Westborough
North Brookfield	Worcester

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