2019 Congestion Management Process

Adopted July 11, 2019

North Front Range
Metropolitan
Planning
Organization

North Front Range Metropolitan Planning Organization

2019 Congestion Management Process

Prepared by:

North Front Range Metropolitan Planning Organization

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Adopted:

July 11, 2019

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North Front Range Metropolitan Planning Organization

RESOLUTION NO. 2019-18
OF THE NORTH FRONT RANGE TRANSPORTATION & AIR QUALITY PLANNING COUNCIL
ADOPTING THE 2019 CONGESTION MANAGEMENT PROCESS (CMP)

WHEREAS, the North Front Range Transportation & Air Quality Planning Council (NFRMPO) is designated as the Metropolitan Planning Organization (MPO) in cooperation with local elected officials and is authorized and required to carry out the continuing, cooperative, and comprehensive ("3C") transportation planning process that results in plans and programs that consider all transportation modes and supports community development, economic development, and social goals; and

WHEREAS, the NFRMPO was designated by the Governor of the State of Colorado as the MPO agency responsible for carrying out the transportation planning process, and for developing and amending the RTP; and

WHEREAS, the NFRMPO was federally designated in 2002 as the Transportation Management Area (TMA) for the Fort Collins and Greeley Urbanized Areas (UZAs); and

WHEREAS, the Fixing America's Surface Transportation (FAST) Act requires that all TMAs develop and implements a CMP as part of the metropolitan transportation planning process; and

WHEREAS, in accordance with the FAST Act, the NFRMPO will submit the updated CMP under the applicable provisions of Federal law to the Federal Highway Adminstration; and

WHEREAS, the CMP was first incorporated into the 2030 Regional Transportation Plan (RTP) and updated in the 2035 RTP and 2040 RTP;

WHEREAS, the Planning Council approves the 2019 CMP and submits copies for informational purposes to CDOT;

NOW, THEREFORE, BE IT RESOLVED THAT the North Front Range Transportation & Air Quality Planning Council adopts the 2019 CMP to guide future transportation planning efforts to minimize congestion and congestion related impacts in the NFRMPO.

Passed and adopted at the regular meeting of the North Front Range Transportation & Air Quality Planning Council held this 11th day of July, 2019.

Dave Clark, Vice Chair

ATTEST:

Suzette Mallette, Executive Director

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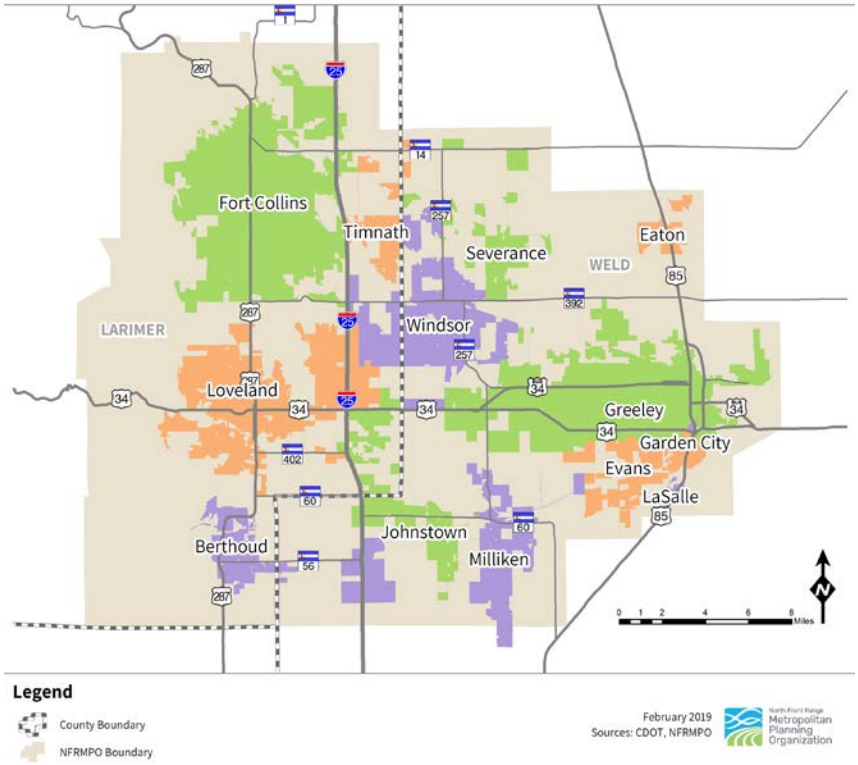
Chapter 1: Background and Purpose of the 2019 CMP

Introduction

A Congestion Management Process (CMP) is a "systematic and regionally-accepted approach for managing congestion."[1] A sound, effective CMP integrates with the entire metropolitan planning process, working to achieve the goals and objectives outlined in the long-range transportation plan and influencing the prioritization and programming of projects for the short- and medium-term. CMPs help develop the structure for implementing a well-performing regional transportation system by analyzing system performance and assessing alternative strategies to improve performance. Strategies should be attainable and tailored to meet local, state, and regional needs.

Figure 1. NFRMPO Planning Area



The North Front Range Metropolitan Planning Organization's (NFRMPO) 2019 CMP establishes a performance-based approach to address congestion within the region, shown in **Figure 1**. Performance-based planning helps ensure investment decisions work together to achieve clear regional Goals and Objectives.

Chapter 2 identifies the congestion-related Goals and Objectives, which serve as the guiding framework for the 2019 CMP. **Chapter 3** provides a robust definition of congestion, including why it occurs, where it is measured, and most importantly, identifies the direct and indirect measures of congestion. **Chapter 4** provides an overview of potential strategies for alleviating congestion. Strategies are grouped into six tiers and include a general description, examples, pros and cons, and other factors or considerations. Finally, **Chapter 5** synthesizes the information provided to examine existing conditions, future need, and potential opportunities for each of the region's congested Regionally Significant Corridors (RSCs).

[1] Congestion Management Process (CMP), FHWA, https://ops.fhwa.dot.gov/plan4ops/focus_areas/cmp.htm, accessed 3/12/19.

Requirements for the 2019 CMP

The Federal Highway Administration (FHWA) defines a CMP as "a systematic and regionally-accepted approach for managing congestion that provides accurate, up-to-date information on transportation system performance and assesses alternative strategies for congestion management that meets state and local needs."[2] Federal requirements mandate: regions with a population over 200,000 in urbanized areas (UZAs), also known as Transportation Management Areas (TMAs), must develop and maintain a CMP and use it to make informed transportation planning decisions. The current transportation funding authorization bill, the 2015 Fixing America's Surface Transportation (FAST) Act, carries forward the specific requirements outlined in Moving Ahead for Progress in the 21st Century (MAP-21), including an emphasis on performance-based planning.

As outlined in the federal regulations (23 CFR Part 450.322)[3] Metropolitan Planning Organizations are required to address congestion management through a cooperatively developed and implemented process. For federally programmed projects within a designated nonattainment area for ozone or carbon monoxide, the regulations state:

"the congestion management process shall provide an appropriate analysis of reasonable…[TDM] and operational management strategies for the corridor in which a project that will result in a significant increase in capacity for SOVs…is proposed to be advanced with Federal funds. If the analysis demonstrates that [TDM] and operational management strategies cannot fully satisfy the need for additional capacity in the corridor and additional SOV capacity is warranted, then the congestion management process shall identify all reasonable strategies to manage the SOV facility safely and effectively (or to facilitate its management in the future)."

Federal regulations specify an effective CMP should include:

- Methods to monitor and evaluate the performance of the multimodal transportation system, identify the underlying causes of recurring and non-recurring congestion, identify and evaluate alternative strategies, provide information supporting the implementation of actions, and evaluate the effectiveness of implemented actions;
- Definition of congestion management objectives and appropriate performance measures to assess the extent of congestion and support the evaluation of the effectiveness of congestion reduction and mobility enhancement strategies for the movement of people and goods;
- Establishment of a coordinated program for data collection and system performance monitoring to define the extent and duration of congestion, to contribute in

[2] Congestion Management Process: A Guidebook. U.S. Department of Transportation, Federal Highway Administration. April 2011. Pg. 1.
[3] 23 CFR 450.322 – Congestion Management Process in Transportation Management Areas. Legal Information Institute. https://www.law.cornell.edu/cfr/text/23/450.322. Accessed 1/24/2019.

determining the causes of congestion, and evaluate the efficiency and effectiveness of implemented actions;

- Identification and evaluation of the anticipated performance and expected benefits of appropriate congestion management strategies that will contribute to the more effective use and improved safety of existing and future transportation systems based on the established performance measures;
- Identification of an implementation schedule, implementation responsibilities, and possible funding sources for each strategy (or combination of strategies) proposed for implementation; and
- Implementation of a process for periodic assessment of the effectiveness of implemented strategies, in terms of the area's established performance measures. The results of this evaluation shall be provided to decision-makers and the public to provide guidance on selection of effective strategies for future implementation.

How does the CMP integrate with other Planning Processes?

The 2019 CMP serves as an active mechanism for managing congestion across the North Front Range. While the 2019 CMP is more process than plan, it does interact with, and inform other NFRMPO plans and programs. Many of the Goals, Objectives, Performance Measures and Strategies identified in **Chapters 2** through **Chapter 4** are included in the region's long-range Regional Transportation Plan (RTP). Other plans help to inform the CMP, including the NFRMPO 2016 Non-Motorized Plan, the 2045 Regional Transit Element (RTE), and the 2019 Freight Northern Colorado Plan.

One of the major functions of the CMP is to guide the project selection process for the Transportation Improvement Program (TIP). As federally required, any project proposed for inclusion in the TIP that adds general-purpose lanes must demonstrate demand and operational management strategies are insufficient to satisfy the need for additional capacity unless the project addresses an established bottleneck or is a safety improvement. If a roadway expansion projects is deemed necessary, the CMP must identify all regional demand and operational management strategies to maintain the functional integrity and safety of the project into the future.

A periodic CMP performance report will be published to monitor the implemented strategies in terms of the performance measures identified in the 2019 CMP. The performance report will identify effective strategies for congestion management, enabling the region to strategically improve system performance.

Public Outreach and Coordination

A comprehensive CMP operates most effectively when developed cooperatively across all member jurisdictions of an MPO. When establishing key components of the 2019 CMP, NFRMPO staff worked closely with the NFRMPO Technical Advisory Committee (TAC). TAC provided feedback and guidance regarding congestion performance measures, congestion-mitigating

strategies, selection criteria for identifying congested corridors, and recommendations for congested segments.

Additionally, the 2019 CMP relied on information from community-adopted plans and programs and from projects programmed in the TIP. These plans, programs, and projects were all approved following extensive local outreach.

Chapter 2: Goals and Objectives

National Goals

As discussed in **Chapter 1**, performance-based planning is a cornerstone of NFRMPO planning activities and legislatively required by the FAST Act. Though MPOs are largely enabled to establish their own goals and objectives, MAP-21 introduced a standard set of National Goals, to help integrate planning across regions and States. Under this unified framework, States and MPOs invest resources in projects that collectively make progress toward the achievement of the following National Goals:

1. **Safety**: To achieve a significant reduction in traffic fatalities and serious injuries on all public roads
2. **Infrastructure Condition:** To maintain the highway infrastructure asset system in a state of good repair
3. **Congestion Reduction**: To achieve a significant reduction in congestion on the National Highway System
4. **System Reliability**: To improve the efficiency of the surface transportation system
5. **Freight Movement and Economic Vitality**: To improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development
6. **Environmental Sustainability**: To enhance the performance of the transportation system while protecting and enhancing the natural environment
7. **Reduced Project Delivery Delays**: To reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices

Using the seven National Goals as a foundation, the NFRMPO enumerated four Goals and 12 Objectives as part of an overarching Goals, Objectives, Performance Measures, and Targets (GOPMT) framework. This framework, developed as part of the 2045 Regional Transportation Plan (RTP), helps to guide the planning and programming of projects within the planning boundary toward achieving the regionally-established vision for the NFRMPO. The CMP strives to work within the framework of the GOPMT and contribute to the achievement of Goals and Objectives related to congestion. The following page lists the Goals and Objectives from the GOPMT framework; Objectives related to congestion are marked with a "(C)". Performance measures related to congestion are discussed in greater detail in **Chapter 3**.

NFRMPO Goals and Objectives from 2045 RTP

Goal Area 1: Economic Development and Quality of Life

Foster a transportation system that supports economic development and improves residents' quality of life.

Objective 1-1 (C): Conform to air quality requirements

Objective 1-2: Maintain transportation infrastructure and facilities

Objective 1-3: Increase investment in infrastructure

Goal Area 2: Mobility

Provide a transportation system that moves people and goods safely, efficiently, and reliably.

Objective 2-1 (C): Reduce number of severe traffic crashes

Objective 2-2 (C): Reduce congestion

Objective 2-3 (C): Improve travel time reliability

Goal Area 3: Multi-Modalism

Provide a transportation system that improves accessibility and transportation system continuity.

Objective 3-1: Support transportation services for all, including the most vulnerable and transit-dependent populations

Objective 3-2 (C): Increase mode share of non-Single Occupant Vehicles (SOV) modes

Objective 3-3 (C): Develop infrastructure that supports alternate modes and connectivity

Goal Area 4: Operations

Optimize operations of transportation facilities.

Objective 4-1 (C): Optimize the transportation system

Objective 4-2 (C): Enhance Transit Service in the NFR region

Objective 4-3: Reduce project delivery time frame

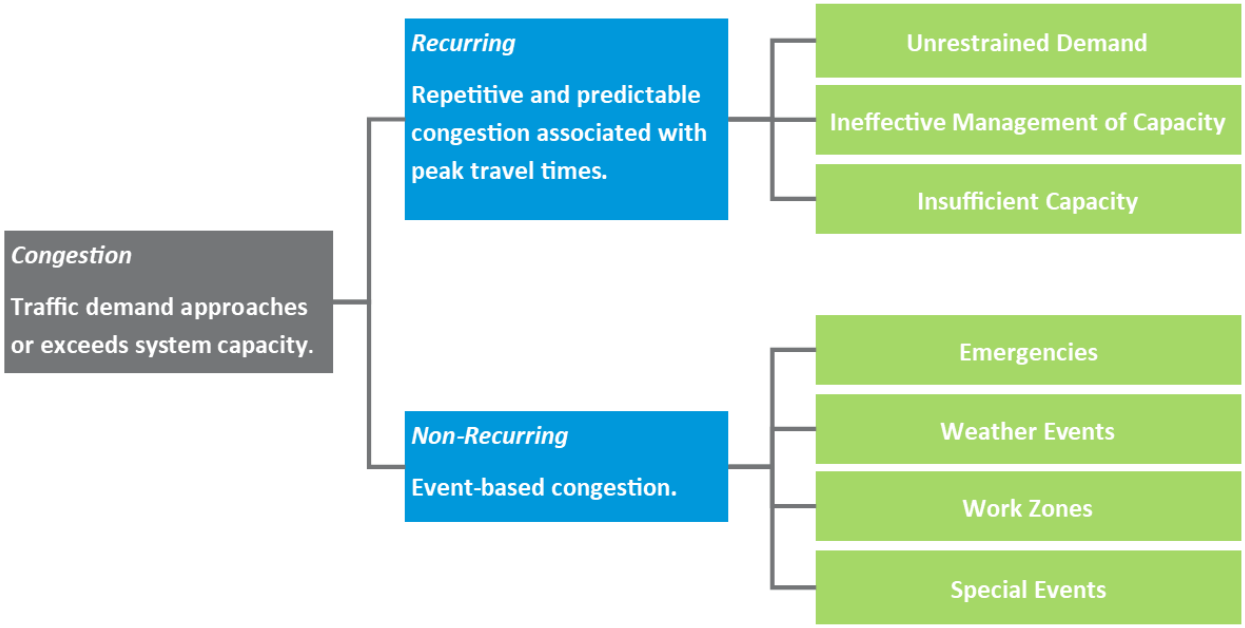
Chapter 3: Quantifying Congestion in the North Front Range

How is Congestion Defined and Why Does it Occur?

Congestion is the build-up of vehicles on certain portions of the transportation system resulting in travel speeds that are slower than "free flow" speeds.[4] Congestion occurs as traffic demand approaches or exceeds the available capacity of the transportation system and is broadly categorized as recurring or non-recurring congestion.

Recurring congestion is associated with an exceedance of available capacity during peak travel times, primarily during the morning and evening commute hours. **Non-recurring congestion** can occur at any time, including during peak travel times, and is often associated with traffic incidents, weather events, special events, work zones, and emergencies. Congestion, both recurring and non-recurring, vary significantly depending on the season, day of the week, and even time of day. Furthermore, both recurring and non-recurring congestion may occur at the same time, exacerbating the event.

Figure 2. Diagram of Congestion and Causes



[4] Traffic Congestion and Reliability: Trends and Advanced Strategies for Congestion Mitigation. FHWA Office of Operations. 12.4.2013. https://ops.fhwa.dot.gov/congestion_report/executive_summary.htm. Accessed 3/29/19.

Where Do We Measure Congestion?

The CMP focuses on all Regionally Significant Corridors (RSCs) identified for the 2045 RTP. The RSC designation allows the NFRMPO to focus limited transportation funding on projects that improve regional travel. In general, the majority of congestion in the region occurs on the RSCs. An RSC is defined as:

> *An important link in a multi-modal, regional network comprised of existing or new transportation corridors that connect communities and/or activity centers by facilitating the timely and safe movement of people, goods, information, and services.*

The following criteria were used to identify RSCs:

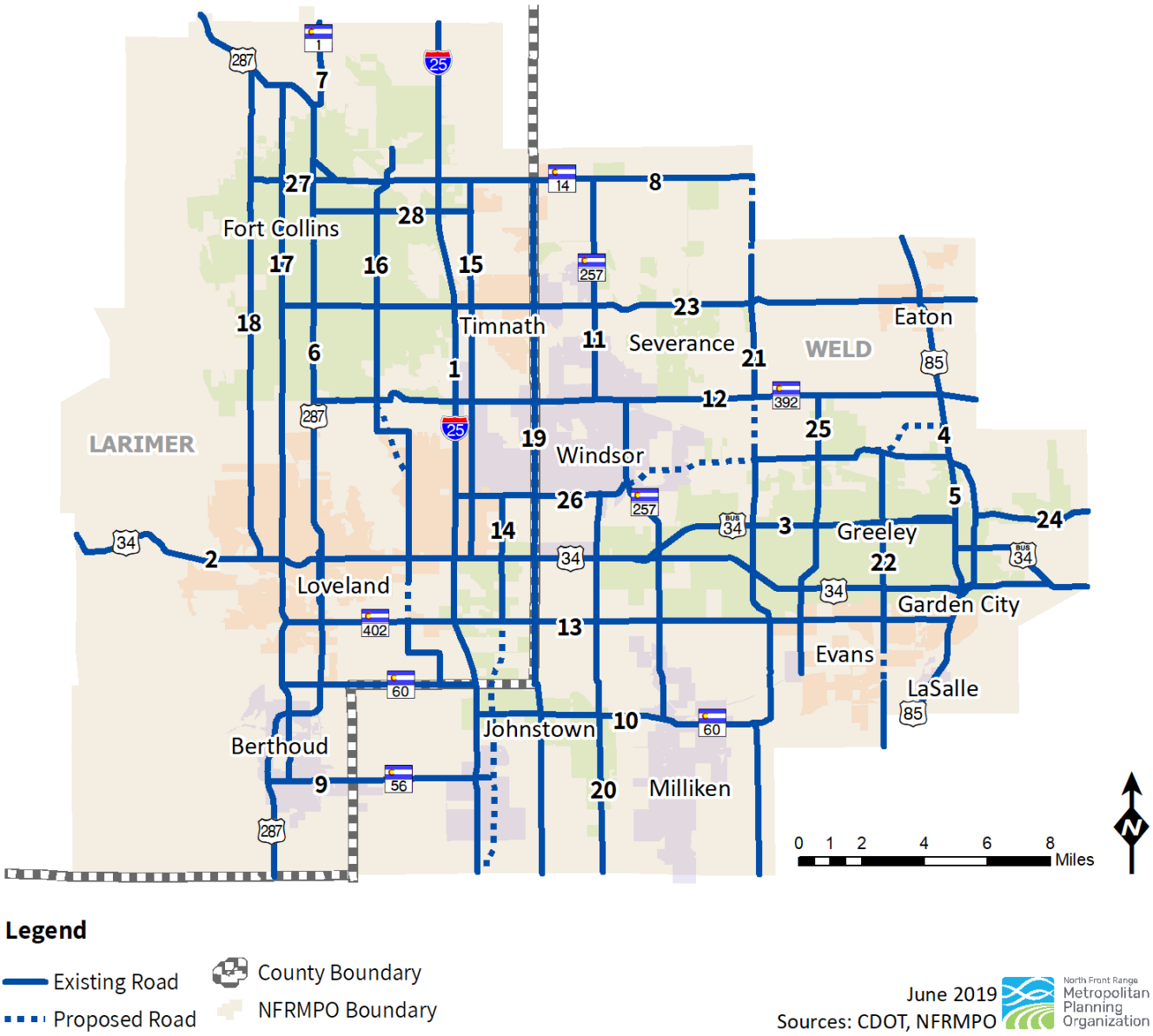
- Includes all Interstates, US highways, and State Highways
  - Colorado Department of Transportation (CDOT) requires a corridor vision be developed for all state highways as part of the regional transportation plan. Since this is required by CDOT, and most state highways, US highways, and Interstate highways are regional in nature, this was established as the first criteria.
- Includes all other roadways that meet the following criteria:
  - The roadway is eligible to receive federal aid;
  - The roadway goes through more than one governmental jurisdiction or connects to an activity center by 2045;
  - Segments of roadway that do not yet exist or are not currently federal-aid eligible have improvements planned by 2045; and
  - The roadway serves regional traffic as determined by local knowledge.

Table 1 lists the location of the 28 RSCs, while **Figure 3** shows the locations of the RSCs.

Table 1: NFRMPO Regionally Significant Corridors (RSCs)

RSC	Name	Centerline Miles		Description
		Current	Buildout	
1	I-25	27.1	27.1	Northern MPO boundary to southern MPO boundary
2	US 34	34.4	34.4	Western MPO boundary to eastern MPO boundary
3	US 34 Business Route	15.5	15.5	US 34 MP 102 on the west to US 34 MP 115.5 on the east
4	US 85	16.3	16.3	WCR 70 on the north to WCR 48 on the south
5	US 85 Business Route	4.4	4.4	US 34 on the south to US 85 on the north
6	US 287	32.5	32.5	Northern MPO boundary to southern MPO boundary, includes Berthoud Bypass
7	SH 1	2.8	2.8	Northern MPO boundary to US 287 on the south
8	SH 14	14.2	14.2	US 287 on the west to eastern MPO boundary
9	SH 56	7	7	US 287 on the west to the RSC 14 extension on the east
10	SH 60	19.8	19.8	US 287 on the west to the southern MPO boundary
11	SH 257	18.6	18.6	SH 14 on the north to SH 60 on the south, includes offset in Windsor
12	SH 392	21.3	21.3	US 287 on the west to US 85 on the east
13	SH 402 / Freedom Parkway	21.2	21.2	LCR 17 on the west to US 85 on the east
14	Larimer County Road (LCR) 3 / Weld County Road (WCR) 9.5	4	12.1	Crossroads Boulevard on the north to southern MPO boundary
15	LCR 5	12	12	SH 14 on the north to US 34 on the south
16	LCR 7 / LCR 9 / Timberline Road	18	21.7	Vine Drive on the north to SH 60 on the south
17	LCR 17 / Shields Street / Taft Avenue	22.2	22.2	US 287 on the north to SH 56 on the south
18	LCR 19 / Taft Hill Road / Wilson Avenue	15.7	15.7	US 287 on the north to US 34 on the south
19	WCR 13	22.1	22.1	SH 14 on the north to southern MPO boundary
20	WCR 17	12.1	12.1	Crossroads Boulevard Extension on the north to southern MPO boundary
21	WCR 27 / 83rd Avenue / Two Rivers Parkway	14.9	18.1	SH14 on the north to SH 60 on the south
22	WCR 35 / 35th Avenue	8.3	9.4	O Street on the north to US 85 on the south
23	WCR 74 / Harmony Road	22.6	22.6	LCR 17 on the west to the eastern MPO boundary
24	8th Street	3.6	3.6	US 85 on the west to the eastern MPO boundary
25	59th Avenue / 65th Avenue	9.1	9.1	SH 392 on the north to 54th Street on the south
26	Crossroads Boulevard / O Street	12	18.8	I-25 on the west to US 85 on the east
27	Mulberry Street	2.7	2.7	LCR 19 on the west to Riverside Avenue (SH 14) on the east
28	Prospect Road	5	5	US 287 on the west to LCR 5 on the east

Figure 3. Regionally Significant Corridors (RSCs)



How is Congestion Measured?

Understanding where congestion occurs within the region and evaluating the effectiveness of the 2019 CMP requires establishing metrics to monitor congestion directly and indirectly. **Table 2** identifies metrics that directly evaluate congestion. **Table 3** identifies select metrics that indirectly affect congestion. The metrics in both tables are explained in greater detail in the following sections.

Table 2. Direct Metrics for Evaluating Congestion

CMP Performance Measure	Description
Travel Time Index (TTI)	Ratio of average peak travel time to an off-peak (free-flow) standard. A value of 1.5 indicates that the average peak travel time is 50% longer than off-peak travel times.
Vehicle Miles Traveled (VMT) per Capita	Miles traveled by vehicles in a specified region over a specified time period. Calculated per person for all trips or for specific destinations including home, work, commercial, etc.
Travel Time Reliability (TTR)	Measures non-recurring delay for all vehicles by comparing the 80th percentile travel time to the average (50th percentile) travel time. A value of 1.5 or higher indicates the segment is not reliable. A corridor may be congested, but reliable if the congestion is consistent.
Truck Travel Time Reliability (TTTR)	Measures non-recurring delay for trucks by comparing the 95th percentile travel time to the average (50th percentile) travel time. A value of 1.5 or higher is considered unreliable.

Table 3. Indirect Metrics for Evaluating Congestion

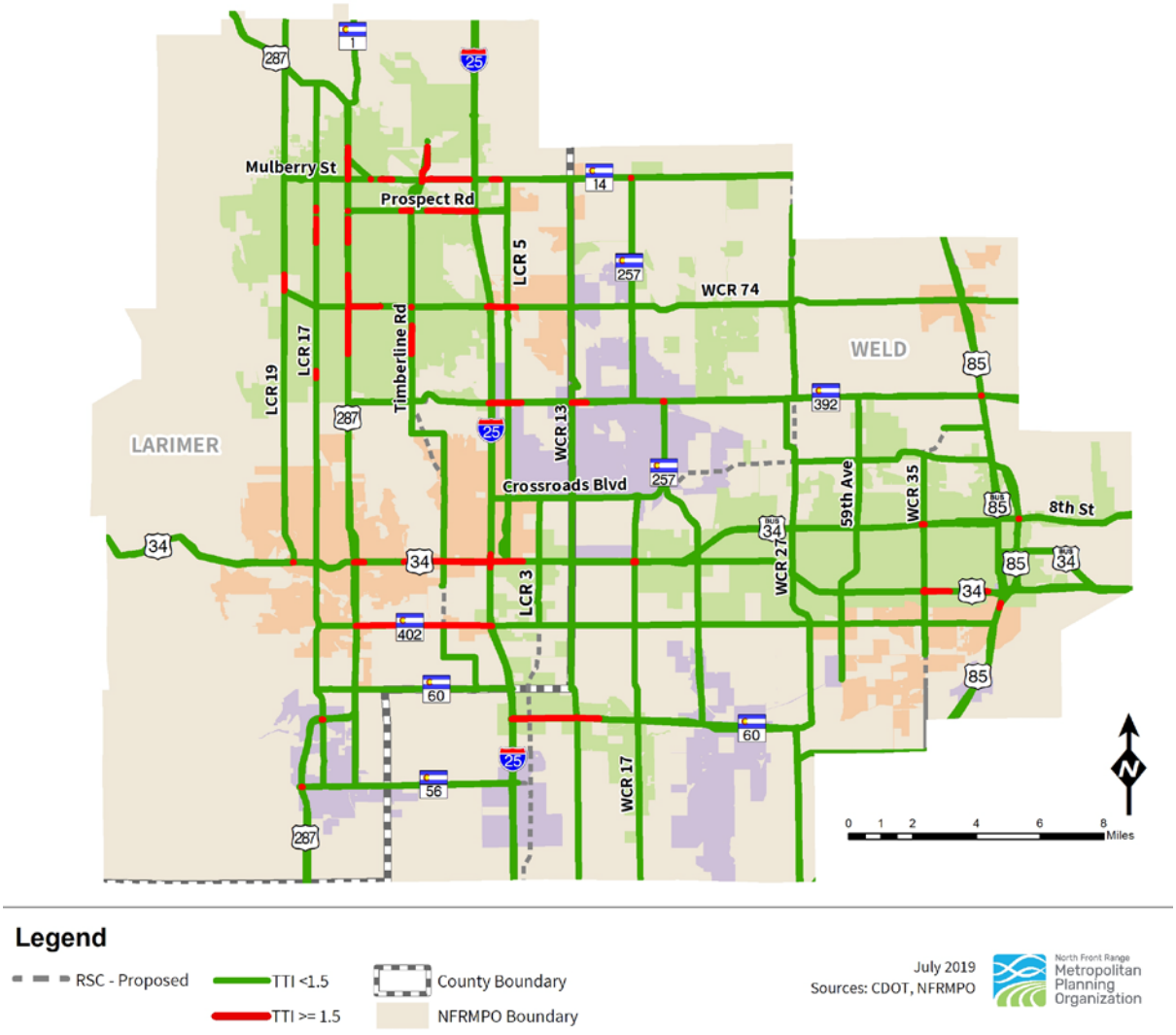
CMP Performance Measure	Description
Number of Crashes	The number of collisions involving one or more vehicles.
Transit Ridership per Capita	The number of unlinked weekday trips per resident within each provider's service area. Measuring per capita helps account for population growth.
Percent of non-Single Occupant Vehicle (SOV) commute trips	Percent of all commute trips completed by any mode other than SOV, including by transit, bicycle, walking, or carpooling.
Percent NHS miles covered by fiber	Percent of NHS miles with fiber-optic cables installed and used for transportation management purposes.

Travel Time Index (TTI)

TTI measures recurring congestion and is defined as the ratio of the travel time during the peak period to the time required to make the same trip at free-flow speeds. For example, a value of 1.5 indicates a 20-minute free-flow trip requires 30 minutes during the peak period.[5] Typically, roadways with a TTI greater than or equal to 1.5 are considered congested.

Figure 4 highlights the regional TTI for 2018, which shows much of the network experienced free-flow or near free-flow conditions. TTI in 2018 was accessed from the INRIX dataset, the NFRMPO 2015 Regional Travel Demand Model (RTDM), and local travel time datasets such as BlueTOAD and Acyclica. Overall, 5.9 percent of the RSC network was congested in 2018.

Figure 4. Travel Time Index of 1.5 or Greater, 2018



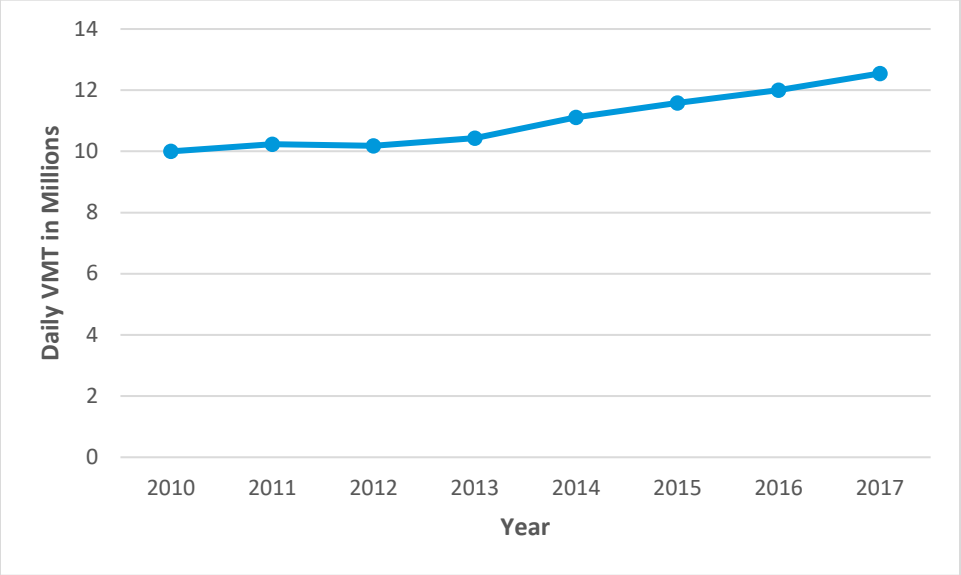
[5] Glossary of Mobility-Related Terms. Texas A&M Transportation Institute. Urban Mobility Information. http://mobility.tamu.edu/ums/media-information/glossary/. Accessed 3/21/19.

Vehicle Miles Traveled (VMT)

VMT is the number of miles traveled by vehicles within a specified region, during a specified time period. Modeling VMT requires estimates of trip origin and destination. As the region's population continues to grow, an increase in VMT is expected. A reduction in VMT demonstrates environmental benefits through reduced emissions, fuel usage, roadway wear, and vehicle wear. Land use planning principles, such as infill development or mixed-use development can be used to help reduce VMT.

According to VMT estimates developed using the 2012 Regional Travel Demand Model (RTDM) and annual VMT estimates on state highways produced by CDOT, daily VMT within the North Front Range increased from 2010 through 2017 as shown in **Figure 5**. Specifically, VMT rose from 10.0M VMT per day in 2010 to 12.5M VMT per day in 2017.

Figure 5. Daily VMT in the North Front Range, 2010-2017

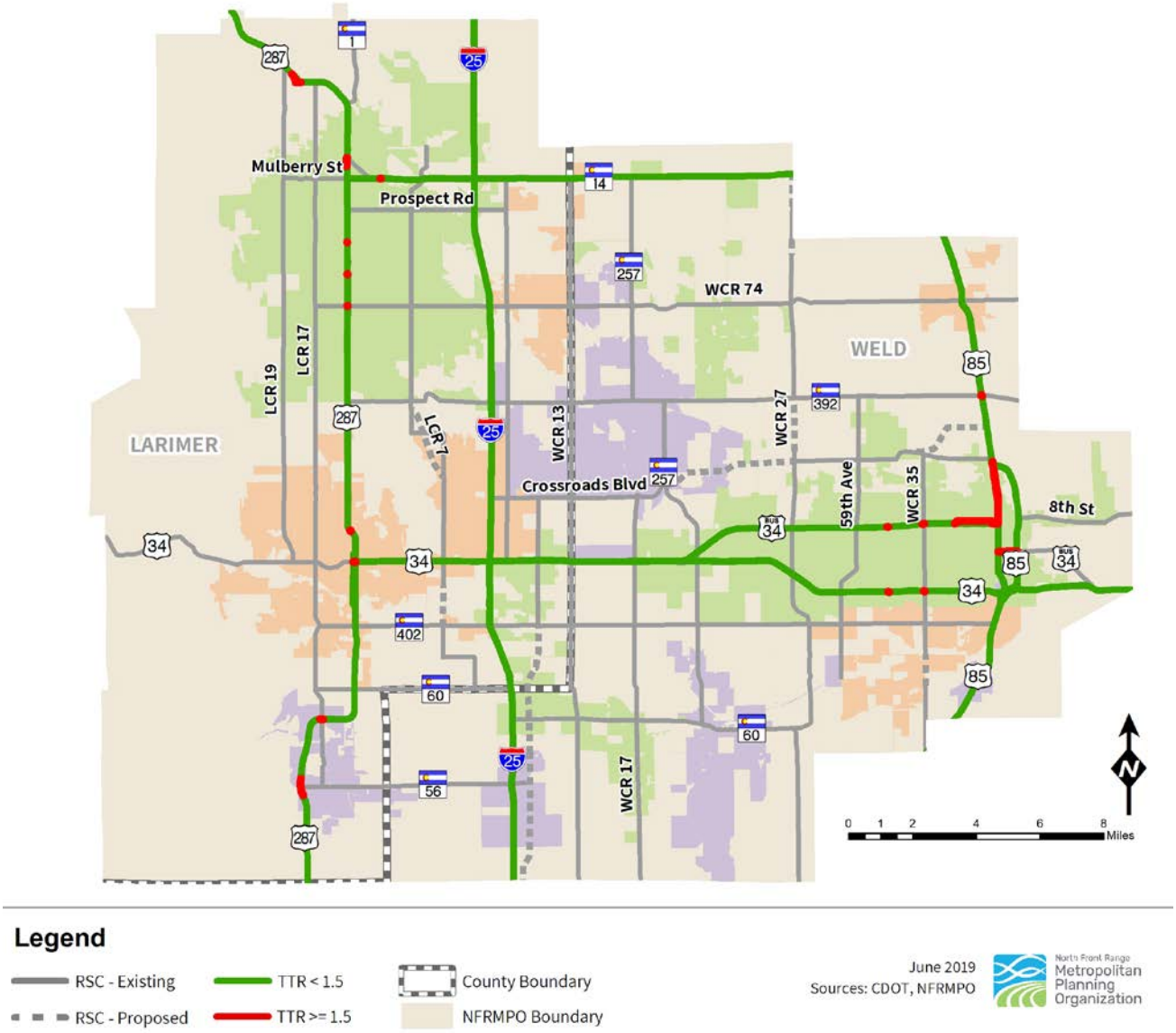


Source: NFRMPO 2012 RTDM and CDOT

Travel Time Reliability (TTR) Index

Whereas TTI measures the average travel time during peak periods to assess average levels of congestion, TTR measures the variance in travel times to assess the consistency or dependability in travel times. Reliability is important for both personal and business travelers so they can plan their travel to arrive on time. Specifically, TTR is measured as the 80th percentile travel time divided by the 50th percentile (median) travel time, with ratios larger than 1.5 considered unreliable. A roadway that typically takes 20 minutes to travel during the evening peak period but sometimes takes over 30 minutes qualifies as unreliable if the longer travel time occurs at least 20 percent of the time. Data for TTR is available from the National Performance Measure Research Data Set (NPMRDS) for the National Highway System (NHS). Roadway segments with a TTR of 1.5 or greater are shown in **Figure 6**.

Figure 6. TTR Index of 1.5 or Greater, 2018

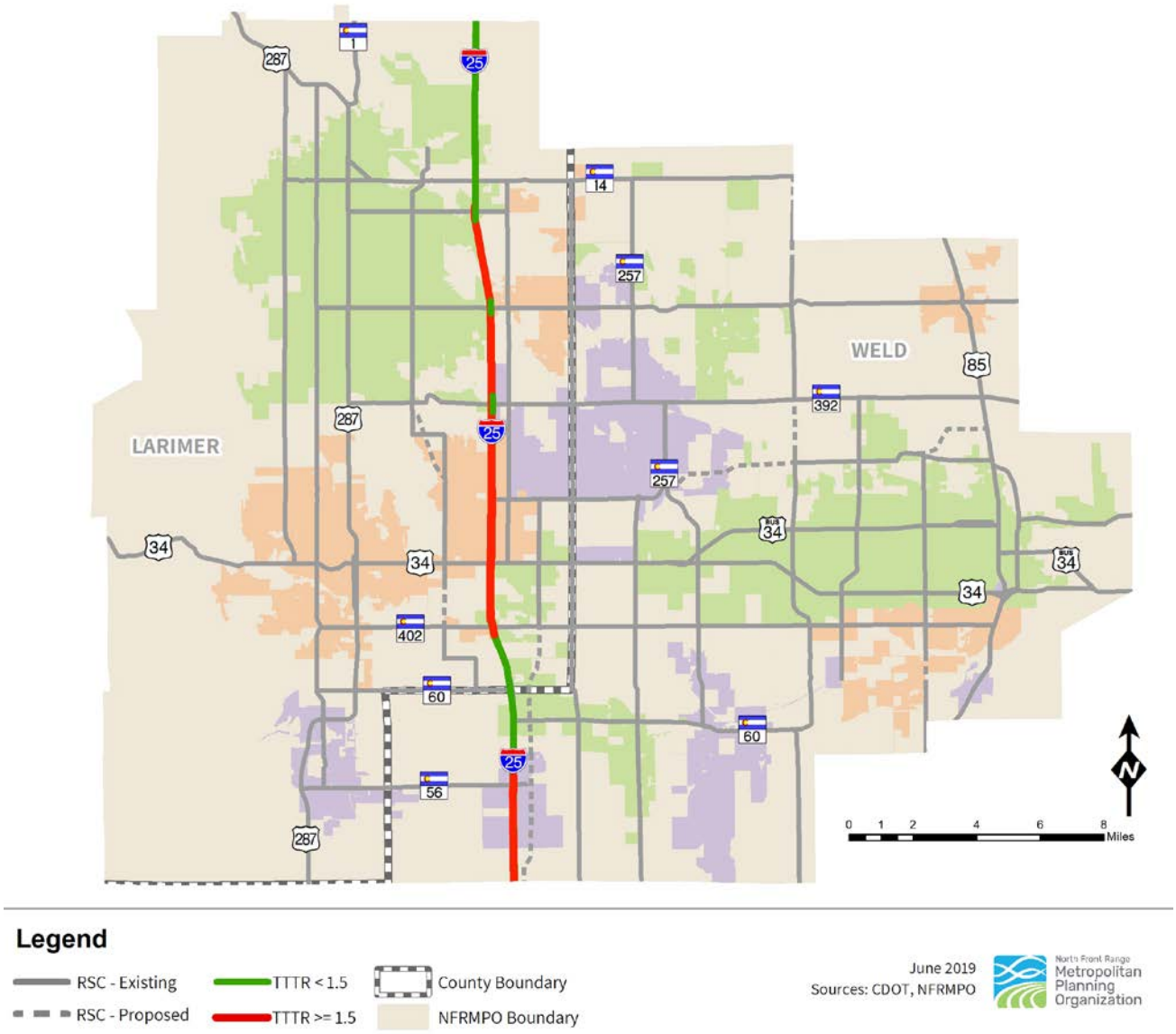


Truck Travel Time Reliability (TTTR) Index

TTTR is a similar measure to TTR but is calculated using only commercial vehicles. TTTR measures the variance in truck travel times to assess consistency or dependability. Specifically, TTR is measured as the 95th percentile travel time divided by the 50th percentile (median) travel time, with ratios larger than 1.5 considered unreliable. A roadway that typically takes 20 minutes to travel during the evening peak period but sometimes takes over 30 minutes qualifies as unreliable if the longer travel time occurs at least 20 percent of the time. TTTR uses different reporting time periods than TTR. Data for TTTR is available from the National Performance Measure Research Data Set (NPMRDS) for the Interstate portion of the National Highway System (NHS). Roadway segments on I-25 with a TTTR of

1.5 or greater are shown in **Figure 7**. The majority of the I-25 corridor is considered unreliable for truck traffic.

Figure 7. TTTR Index of 1.5 or Greater, 2018

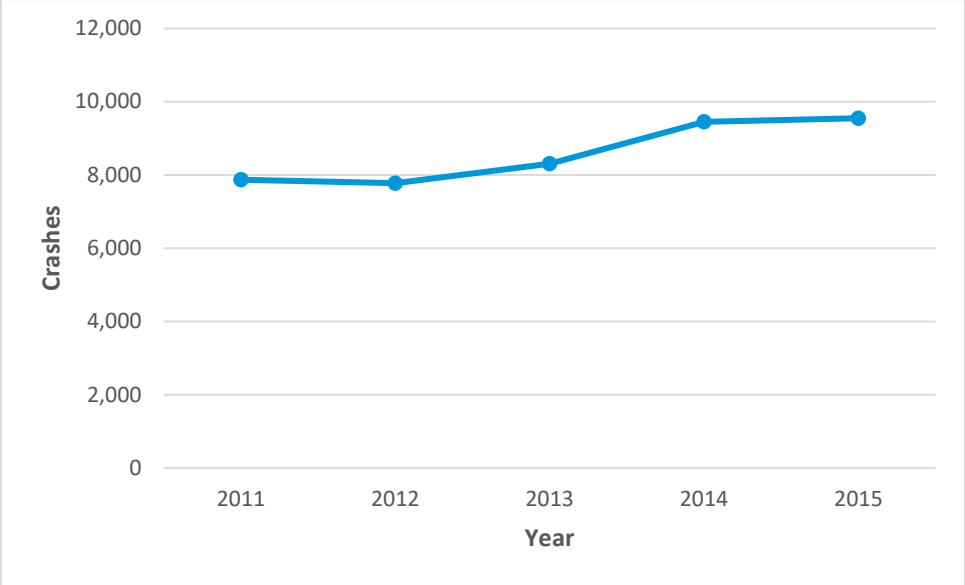


Number of Crashes

Crashes can cause non-recurring congestion; however, not all crashes result in congestion, such as crashes occurring at low-volume time periods and/or in low-volume locations. Crash data is available from CDOT and includes crashes on all public roads. Crashes on state facilities are geocoded by CDOT, while crashes on local and county facilities are geocoded by NFRMPO.

Crashes within the North Front Range region decreased slightly from 2010 to 2011, then rose every year from 2012 through 2015, as shown in **Figure 8**.

Figure 8. Number of Crashes in the North Front Range Region, 2010-2015



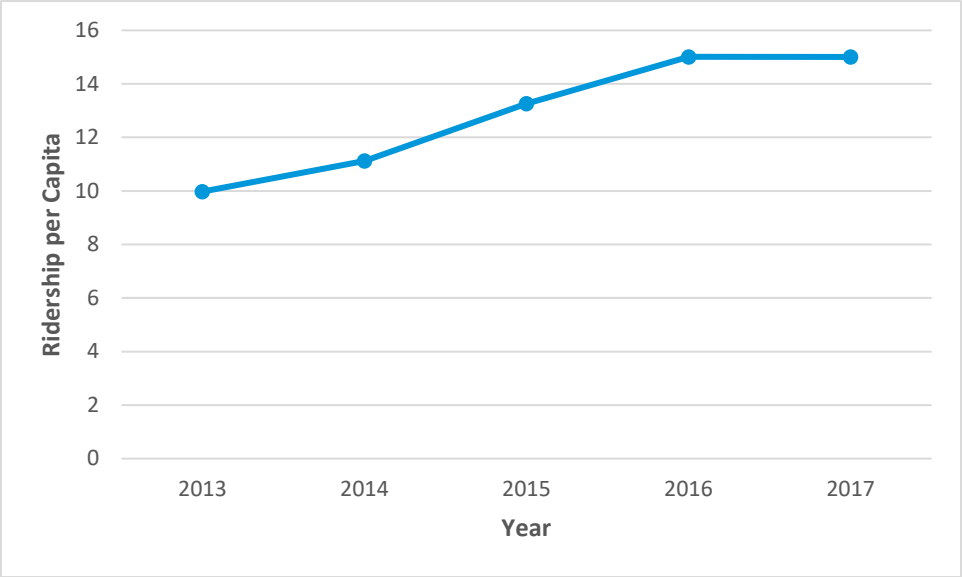
Source: CDOT and NFRMPO

Transit Ridership per Capita

Transit ridership indicates the use of the transit system relative to the population served by the transit system. Data is available from the National Transit Database (NTD) for three of the providers within the region – City of Loveland Transit (COLT), Greeley-Evans Transit (GET), and Transfort – and data for Bustang, the fixed-route transit service operated by CDOT is available from CDOT.

Transit ridership per capita increased every year from 2013 to 2016 as shown in **Figure 9**. Ridership increased from 10 transit rides per capita in 2010 to 15 transit riders per capita in 2016, a 50 percent increase. Transit ridership per capita in 2017 held at 15 transit rides per capita. New service, such as the Bustang North Line, which began in 2015, contributed to the increase in ridership per capita.

Figure 9. Fixed-Route Transit Ridership per Capita, 2013-2017



Source: NTD and CDOT

Percent of non-Single Occupant Vehicle (SOV) commute trips

Travel to work often occurs during peak periods, and the majority of commute trips occur in SOVs, which consume more space on the transportation network than any other mode. This performance measure assesses the percent of commute trips occurring by non-SOV modes such as bicycling, walking, transit, and carpooling. Survey data on commute modes is available from the U.S. Census American Community Survey (ACS).

Within the North Front Range, approximately 23 percent of commute trips are non-SOV, including carpooling with nine percent, working at home with six percent, bicycling with three percent, walking with three percent, public transit with one percent, and other modes at one percent of workers.

Percent NHS miles covered by fiber

Fiber-optic networks are used to maximize operational efficiency and management of the existing roadway infrastructure through the use of Intelligent Transportation Systems (ITS) and devices. Data for this measure is still under development and will be reported in the periodic CMP performance Report.

Chapter 4: Identifying Strategies to Manage Congestion

Strategies Overview

Effectively managing congestion over time requires a multi-faceted approach. Though roadway expansion increases capacity in the short term, this strategy induces Single Occupant Vehicle (SOV) travel demand for the treated corridor in the long-term and therefore should not be considered as a stand-alone solution. Longer-term congestion-management strategies include reducing transportation demand, often referred to as transportation demand management (TDM) and improving the overall efficacy of the existing system through improvements to operational management and implementation of Intelligent Transportation Systems (ITS).

As discussed in **Chapter 1,** regulations specify all reasonable TDM and operational congestion management strategies must be evaluated and deemed insufficient prior to the approval of a "project that will result in a significant increase in capacity for SOVs." The regulations further specify if an SOV capacity project is deemed necessary, supplementary TDM and operational efficiency measures must be identified through the CMP to preserve the function of the capacity project into the future. The following subsections highlight several potential strategies for reducing congestion in the region. Strategies are categorized into six Tiers, ranked generally by efficacy of mitigating congestion.

1. **Tier 1**: Strategies that most directly reduce congestion by shortening, reducing, or circumventing the need for trips.
2. **Tier 2**: Strategies that increase the availability and access to non-motorized modes and transit.
3. **Tier 3**: Auto-oriented TDM strategies that limit SOV trips during peak travel times.
4. **Tier 4**: Strategies that improve roadway operations without expansion, including ITS.
5. **Tier 5**: Traffic Incident Management (TIM) strategies.
6. **Tier 6**: Roadway capacity projects.

While this Chapter does not include a comprehensive list of strategies available to manage congestion, it can serve as a starting point for identifying potential projects oriented at reducing congestion, where appropriate, within the region's transportation system. **Chapter 5** uses the strategies identified in the following sections to provide recommendations for managing congestion along some of the region's most congested corridors.

Tier 1: Reducing Trip Generation and Shortening Trips

Of the factors resulting in congestion, reducing travel demand has the greatest potential for producing long-lasting, high impact on congestion for the least cost. Travel demand is typically measured in Vehicle Miles Traveled (VMT), which is described in more detail in **Chapter 3**.

Reducing trip generation and shortening trip length are considered Tier 1 strategies because they remove the need to use a vehicle either directly or indirectly. For example, being able to work from home eliminates the need to commute to an office during peak travel hours. Shortening trips can also eliminate VMT by making trips by bicycling and walking more feasible.

Tier 1 Strategies include:

- Efficient Land Use and Development Practices
- Telecommuting

Efficient Land Use and Development Practices

Efficient development practices include infill development, which directs new construction to underutilized or vacant parcels in urban areas already served by transportation, utilities, etc.; mixed-use development, which encourages multiple uses in a single structure or the construction of multiple uses adjacent to one-another to encourage walkability; and transit-oriented development, which encourages dense, mixed-use development centered around high-performing transit nodes. These practices encourage development that shortens trips, while accommodating all modes of transportation.

Example

The Foundry development in downtown Loveland is bringing a movie theater, apartments, hotel, retailers, community plaza, and parking to an area previously occupied by less-dense land uses. The City of Fort Collins has developed a Transit-Oriented Development (TOD) Overlay Zone to focus growth around the MAX Bus Rapid Transit (BRT) system along the Mason Street corridor.

Pros

- Can leverage private dollars
- May increase density to a level that supports transit
- Reduces need for investing in new general-purpose transportation infrastructure

Cons

- May require investment in maintenance, rehabilitation, or expansion of existing infrastructure and utilities

Other Factors or Considerations

- Outside of NFRMPO jurisdiction, must be planned and implemented by local planning agencies
- Often driven by external-market forces.
- Implementation may be limited by political or social factors.

Image Credit: The Foundry

Telecommuting

Working from home and completing interpersonal tasks via email, telephone, video-chats, or other forms of communication technology. Many employers within and outside of the NFRMPO region offer telecommuting options to their employees.

Pros	Cons
• Very inexpensive to implement • Directly reduces commute trips, the biggest contributor to recurring congestion • May result in significant reduction of Ozone precursors and better air quality in the nonattainment area	• May be challenging to implement where in-person meetings are frequent and electronic attendance reduces efficacy of meetings • Technical difficulties may prevent efficient communication

Other Factors or Considerations

- Some workplaces offer flexible telecommuting, encouraging employees to telecommute when interpersonal communications are not required.
- Optional telecommuting during extreme weather events may increase the safety of employees and reduce the risk of crashes.

Tier 2: Encouraging Shift to Alternative Modes of Transportation

Once trips have been either eliminated or shortened, the next best strategy for reducing travel demand are those that encourage alternative modes of transportation, including transit, bicycling, and walking. Bicycle and pedestrian modes may also include e-bikes, scooters, skateboards, mobility-assistance devices, etc. Though buses do count as a vehicle on the road, they retain the capability to significantly reduce the total number of vehicle miles traveled. Like Tier 1 strategies, bicycling, walking, and other modes of alternative transportation can eliminate vehicle miles traveled. However, these modes may not be feasible if trip lengths are too long. Typical trip length for a bicycle commute is under four miles and under one mile for a pedestrian[6]. These trips may need to be even shorter for travelers with a disability. Therefore, though still high impact strategies, strategies encouraging alternative modes of non-car transportation are included in Tier 2.

Tier 2 Strategies include:

- Bicycle Infrastructure
- Bicycle Share Service
- Bus Rapid Transit (BRT)
- Car Sharing
- Complete Streets Policies
- Mobility Hubs
- Parking Pricing or Parking Restrictions
- Pay-As-You-Drive Insurance
- Pedestrian Infrastructure
- Transit Incentives
- Transit Service Quality Factors
- Transit Service Quantity Factors

[6] Commuting in America 2013, American Association of State Highway and Transportation Officials, http://traveltrends.transportation.org/Documents/B14_Bicycling%20and%20Walk%20Commuting_CA14-4_web.pdf. Accessed 1/25/2019.

Bicycle Infrastructure

Improvements to on-road or separated facilities that encourage bicycle travel by increasing safety through a variety of corridor-specific considerations. Improvements often include "sharrows" or bicycle route signage, reminding cars to share the road with bicyclists; bicycle lane striping and physical barriers to provide a dedicated space for cyclists within the road right of way; or completely separated facilities such as trails/shared-use paths.

Example

The West Mulberry Street Improvement project in Fort Collins successfully tested several different corridor treatments on the North and South sides of the West Mulberry Street. The project reconfigured the corridor from four through lanes to two through lanes with a center turn lane and added striped, buffered, and/or protected bicycle lanes.

Pros

- Increased safety for cyclists and pedestrians by reducing bicycle-automobile conflicts on roads and bicycle-pedestrian conflicts on sidewalks
- Increase frequency of use for beginner and intermediate cyclists
- Pavement striping and markings and signage help maintain safe automobile speeds by providing visual cues to drivers

Cons

- Site constraints may limit design possibilities
- Construction and maintenance can be costly depending on the project
- Redistributing space among road users can be unpopular

Other Factors or Considerations

- Improvement type depends on a combination of traffic volumes, speed differential, available space, destinations along the corridor, and more. See the NFRMPO's 2016 Non-Motorized Plan or National Association of City Transportation Officials' (NACTO) Urban Bicycleway Design Guide for information on design considerations.
- Including improvements as part of other road construction or maintenance projects may yield cost savings.
- Promotional and educational events can encourage use of facilities and improve understanding of their positive impacts.
- Conflict points at intersections and other locations with weaving motor vehicle traffic may require special attention.

Image Credit: City of Fort Collins

Bicycle Share Service

A system in which shared bicycles are made available to individuals for trips around town. Bicycles can be checked out from designated locations for designated amounts of time.

Example

Pace Bicycle Share in Fort Collins has a system of 250 bicycles across 42 stations around the City. Bicycles can be located and rented using a smartphone at both pay-as-you-go and plan rates. Bicycles can be returned to the designated stations or public bicycle racks. The University of Northern Colorado (UNC) in Greeley operates a Blue Cruiser Bicycle Program for students to check out bicycles free of charge for a week at a time from the Campus Recreation Center.

Pros

- Offers a comfortable and accessible entry for people unfamiliar with biking
- Allows users to access bicycles without buying their own
- Bicycle fleets are maintained and repaired professionally

Cons

- Systems have geographic limitations
- Requires a certain level of population and employment density to make the system sustainable
- If the system is not managed well, bicycles may be neglected and can obstruct public rights-of-way

Other Factors or Considerations

- The appropriate system model depends on the user base (students, tourists, residents, etc.).
- Public and private partnerships and advertisement opportunities can help kickstart and maintain the system.

Image Credit: City of Fort Collins and University of Northern Colorado

Bus Rapid Transit (BRT)

BRT can be thought of as an above-ground subway or a rubber-tired light rail system with the added benefit of having greater operating flexibility and lower costs. BRT is "an integrated system of facilities, equipment, services, and amenities that improves the speed, reliability, and identity of bus transit."[7] BRT systems often have dedicated right-of-way lanes, signal priority, and station platforms level with the bus floor to accelerate passenger boarding time and to allow wheelchairs and strollers to easily roll on or off the bus.

Example

Transfort's MAX has dedicated lanes, frequent service (10-minute headways on weekdays until 7:00 p.m.), raised station platforms, and signal priority at some intersections.

Pros

- BRT can have different features depending on the corridor, which can be phased in over time
- Marketing can effectively portray BRT as an upscale or specialized service
- Dedicated lanes mean transit does not need to wait when traffic is heavy
- Focused on speed and reliability

Cons

- Very costly to implement
- BRT can be watered down ("BRT creep"), losing its luster and become an expensive, but simple limited bus service
- Relies heavily on marketing more than substance in many cases
- Potentially reduces service on local routes
- Potentially reduces funding for local routes as the focus is on the specialized services

Other Factors or Consideration

- BRT features are not one-size-fits-all and can be adjusted to fit the community and land use in the surrounding area.
- The Institute for Transportation & Development Policy (ITDP) advises on BRT and what constitutes a BRT route or system: https://www.itdp.org/library/standards-and-guides/the-bus-rapid-transit-standard/what-is-brt/
- BRT can be seen as a step toward light rail or higher capacity transit. The Los Angeles Metro has considered upgrading the Orange Line from a BRT line to a light rail line. https://la.curbed.com/2018/7/26/17617240/orange-line-improvements-travel-times-approved

[7] TCRP Report 118. Bus Rapid Transit Practitioner's Guide. Transportation Research Board. 2007. Washington, D.C. http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_118.pdf. Accessed 1/25/19.

Car Sharing

Through a membership, participants pay to rent vehicles for personal trips from a third party. Ownership costs such as car payments, insurance, maintenance, are spread among the user base.

Example

Zipcar operates at several locations around CSU's main campus in Fort Collins with discounted hourly rates for faculty, staff, and students aged 18 and older.

Pros

- By avoiding the costs of auto ownership, users have more flexibility to determine the mode choice that most effectively meets their needs
- A diverse fleet reduces the need for people to own larger, less fuel efficient vehicles for specific occasions
- Dedicated parking reduces the time spent by car owners looking for parking in urban areas

Cons

- Availability of the fleet is uncertain
- Requires planning and time to book a rental and travel to and from the car's location
- Certain age groups and people with a poor driving record may not qualify for membership

Other Factors or Considerations

- Dedicated on-street or off-street parking is required.
- Discounts through schools or employers can encourage alternative transportation choices.

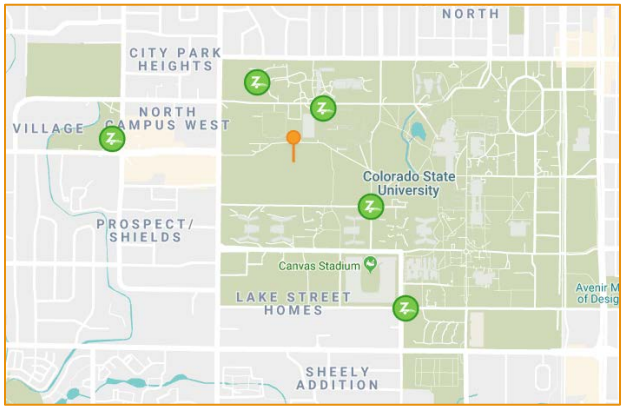


Image Credit: Zipcar and Rocky Mountain Collegian

Complete Streets Policies

Complete Streets are streets designed to enable safe access for users of all ages and abilities, including pedestrians, bicyclists, motorists, and transit riders. The adoption of a Complete Streets policy by communities encourages the routine design and operation of the entire right-of-way to enable safe access for all users.[8]

Example

The City of Fort Collins has a Complete Streets policy ensuring bicycle lanes and sidewalks are a part of newly constructed streets. The Colorado Transportation Commission's Bicycle and Pedestrian Policy Directive 1602.0 (dated October 22, 2009) and subsequent State Statute 43-1-120 codifies the accommodation of bicyclists and pedestrians on the state highway system.[9]

Pros

- Institutionalizes design considerations and standards into road projects
- See "Bicycle Infrastructure Improvements" and "Pedestrian Infrastructure Improvements"

Cons

- See "Bicycle Infrastructure Improvements" and "Pedestrian Infrastructure Improvements

Other Factors or Considerations

- ChangeLab Solutions offers Complete Streets model comprehensive plan language, local ordinance and resolution language, and state legislation and resolution language.

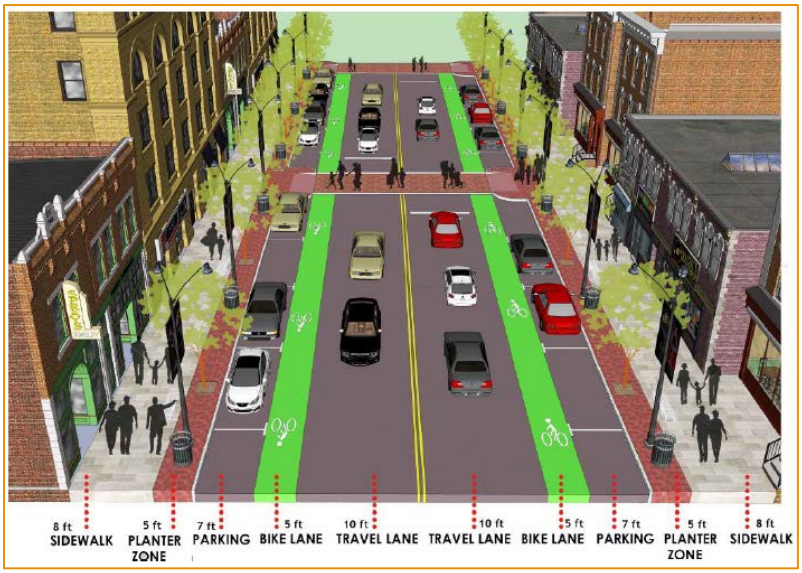


Image Credit: The Foundry

[8] What are Complete Streets? National Complete Streets Coalition. Smart Growth America. http://www.smartgrowthamerica.org/complete-streets/complete-streets-fundamentals/complete-streets-faq. Accessed 2/12/19.

[9] CDOT Statewide Bicycle and Pedestrian Plan, 2015. Accessed 2/12/19.

Mobility Hubs

In conjunction with parking pricing, designated parking for carpooling, vanpooling, transit riders, etc. can further incentivize ridesharing by ensuring convenient parking where parking spaces are otherwise limited.

Example

CSU provides designated parking for students and faculty who carpool. They also include an "Emergency Ride Home" program to further encourage carpooling.

Pros	Cons
• May incentivize ridesharing • Reduces congestion associated with circulating for parking	• None

Other Factors or Considerations

- May only be necessary where parking spaces are limited.
- To further incentivize ridesharing, designated parking should be made as convenient as possible to the final destination.

Parking Pricing or Parking Restrictions

Parking restrictions limit the amount of time a vehicle is allowed to remain in a space. Parking restriction may also mean limiting the number of available parking spaces. Parking pricing refers to the price associated with the use of a parking space. Pricing can be fixed or variable depending on time of day/week or demand.

Example

CSU requires parking permits and offers metered parking to disincentivize students from driving to campus. Many communities offer two hour on-road parking but discourage over-night parking.

Pros	Cons
• Encourages the use of other modes	• May have limited political viability

Other Factors or Considerations

- Pricing may fluctuate to ensure a certain percentage of parking spaces are vacant.
- To maximize the efficacy of parking restrictions and pricing, other modes of travel, such as transit or bicycling, must be made accessible, convenient, and intuitive.

Pay-as-You-Drive Insurance

Vehicle insurance premiums vary according to the number of miles driven. This gives drivers who drive less an opportunity to pay a lower variable cost rather than a higher, fixed-cost insurance.

Example

The Colorado Low-Mileage Discount uses OnStar telematic technology to reward those who drive less than 15,000 miles annually[10].

Pros

- Encourages non-SOV travel including carpooling, taking transit, biking, and walking both for commute trips and mid-day trips

Cons

- May only reward drivers who would have had low-mileage either way
- Drivers must be active OnStar subscribers and opt-in to the Colorado Low-Mileage Discount Program
- Drivers may feel any level of in-vehicle data collection is too invasive

Other Factors or Considerations

- There must exist a significant difference in the cost of insurance between Pay-as-You-Drive and traditional insurance to encourage a shift towards less driving.
- As Colorado considers moving away from a gas tax, Pay-as-You-Go data collection systems could serve as a model for tracking roadway-usage.

[10] Pay-As-You-Go Auto Insurance, http://www.lowmileagediscount.com/US/CO/colorado-driving-discount.asp, accessed 3/22/19.

Pedestrian Infrastructure

Improving pedestrian infrastructure can enhance safety, ensure American with Disabilities Act (ADA) compliance, and boost the overall pedestrian experience, encouraging more people to choose active transportation for short trips and improving access to transit or other alternative modes.

Example

Several NFRMPO communities have installed Rectangular Rapid-Flash Beacons (RRFBs) or High-Intensity Activated Crosswalk (HAWK) Beacons at common pedestrian road crossings to alert drivers when a pedestrian is crossing the road. Additionally, Fort Collins has developed a "Sidewalks to Everywhere" program funded by a specific sales tax that allows for repair of existing sidewalks as well as construction of new sidewalks where there are existing gaps to improve the pedestrian experience.

Pros

- Improves safety and comfort of the pedestrian environment for both transportation and recreation
- Provides better access to various destination and other transportation modes, encouraging alternative transportation choices

Cons

- Construction and maintenance can be costly depending on the project
- Site constraints may limit design possibilities

Other Factors or Considerations

- ADA compliance should be a top consideration for pedestrian improvements.
- Improvement type depends on a combination of traffic volumes, speed differential, available space, destinations along the corridor, and more. See the NFRMPO's 2016 Non-Motorized Plan or National Association of City Transportation Officials' (NACTO) Urban Street Design Guide for information on design considerations.
- Including improvements as part of other road construction or maintenance projects may yield cost savings.
- Promotional and educational events can encourage use of facilities and improve understanding of their positive impacts.

Image Credit: Google, Inc.

Transit Incentives

Incentives may be offered to students, employees, or residents to help reduce the cost of transit to the user. Examples of incentives include free or discounted public transportation passes, employer-provided subsidies, or pre-tax payroll reductions.

Example

The City of Fort Collins provides free transit passes to all employees, allowing them to use the Transfort network for no fare. Transit pricing factors is a form of transit incentive, which reduces or eliminates fares for the rider. These can play a large role in increasing transit ridership because the user does not need to pay for gas, insurance, parking, and can multi-task while riding. Fare reduction or elimination programs are often found in partnership with K-12 schools, universities, and/or employer-based programs.

Pros

- Additional transit ridership can incentivize investment in more routes, increased infrastructure, and other tangential benefits
- Riding transit can improve health
- Riding transit reduces automobile usage, which frees up limited parking
- Riding transit can be tied to a multimodal commute, meaning the use of bicycles or walking to commute

Cons

- Incentives must be paid by fees or businesses
- Transit can be a divisive issue for individuals who do not like subsidizing government programs
- Transit is relatively cheap in the NFRMPO region already ($1.25/ride for City of Loveland Transit (COLT) and Transfort, $1.50/ride for GET)

Other Factors or Considerations

- Transit access is limited in much of the NFRMPO region, especially outside the cities of Fort Collins, Greeley, and Loveland.
- The NFRMPO region is in nonattainment of ozone. Transportation emissions is one of the largest sources of ozone precursors, which may be reduced through non-SOV investments.
- Transit ridership is known to fluctuate with the price of gas, availability of parking, and other factors which may not be addressed by incentives.

Transit Service Quality Factors

Improving transit convenience and experience by adding transit stop amenities, off-board fare collection, on-board cleanliness and comfort, providing efficient route structures, clear bus scheduling information and schedule reliability, station and in-route safety, and customer service.

Example

In 2018, COLT reorganized their three hourly routes into five routes, two with half-hourly frequencies. The new routes connect either the North Transfer Point (Loveland Food Bank) or the South Transfer Point (8th St between Lincoln and Cleveland Avenues) to each quadrant of the City and a route along US287. The routes are easier to understand, provide two-directional service on certain lines, and are easily represented on maps. GET riders benefit from real-time bus route information available with the RouteShout app, which uses GPS data to track when the bus will arrive at each stop.

Pros

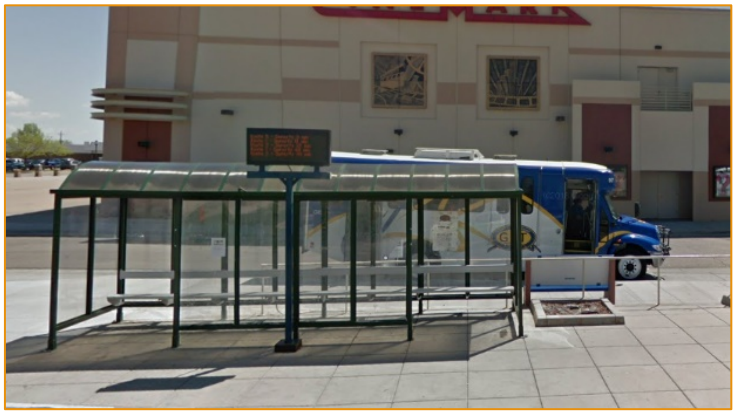
- Service quality can be improved gradually and in phases, meaning limited funding can be used over time
- Reduces travel time for transit users
- Reduce congestion and VMT by encouraging a mode shift to transit
- Can have health improvements as people walk to the bus and rely less on their cars

Cons

- Many improvements require long-term funding
- Many improvements require meeting a certain ridership threshold
- Improvements can take time to catch on with riders

Other Factors or Considerations

- Other quality factors, like sidewalk connectivity or snow removal, may be outside of the transit agency's purview but should be considered



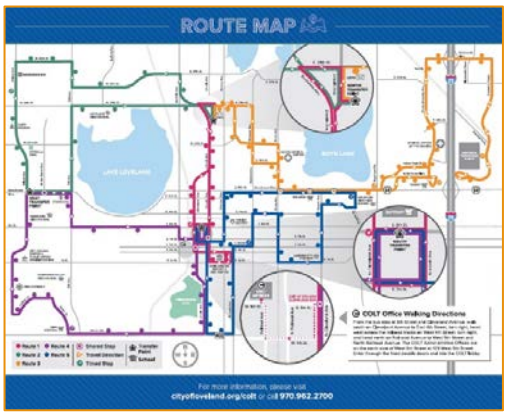


Image Credit: Greeley-Evans Transit and City of Loveland Transit

Transit Service Quantity Factors

Adding key local and regional routes, increasing service hours, reducing the time between transit vehicles, reducing transfer time, prioritizing transit vehicles at traffic signals, and focusing routes on high density corridors or locations.

Example

In 2016, GET reorganized its routes and was able to provide additional service on two routes: Route 1 and Route 5. Route 1 runs every half hour all day, Monday through Friday, and provides service from the GET Regional Transportation Center to the Greeley Mall Transit Center through western Greeley. Route 5 runs every 20 minutes for most of the day, Monday through Friday, between the GET Regional Transportation Center and the Greeley Mall Transit Center via the US85 corridor.

Pros

- Improved frequencies attract more choice riders
- Additional service hours can reduce the need for SOVs because errands can be run at more times of day with less wait-time between buses
- Could benefit non-commuters and those relying solely on transit with additional service

Cons

- Increasing service hours requires additional funding or cuts in service elsewhere
- Improvements to transit service can take time to reap the benefits

Other Factors or Consideration

- Changes to transit service face an issue of frequency versus coverage – should you focus on where ridership is or make less frequent routes go to more places?

Tier 3: Increasing Vehicle Occupancy and Shifting Travel Times

Increasing vehicle occupancy and shifting travel times continue to contribute to a reduction in travel demand, especially during key peak periods. As vehicle-centric strategies, they do not address congestion as directly as Tier 1 and Tier 2 strategies. However, increasing vehicle occupancy and shifting travel times may serve a broader audience, reducing vehicle miles traveled during peak-periods, while affording more flexibility in both trip length and destination than Tier 1 and Tier 2 strategies.

Tier 3 Strategies include:

- Alternative/Flexible Work Schedules
- Congestion Pricing
- Guaranteed Ride Home
- High Occupancy Vehicle (HOV) Lanes
- Ridesharing

Alternative/Flexible Work Schedules

Flexible work schedules allow employees to set work schedules outside of the typical workday structure, which enables commuting during off-peak hours.

Example

Many employers within and outside of the NFRMPO region offer flexible work schedules to their employees.

Pros

- Reduces demand during peak-travel periods
- Could result in significant improvements to air quality
- Inexpensive to implement
- Saves commuter time and money

Cons

- May be difficult to implement for some industries that require employees present during core hours

Other Factors or Considerations

- Work schedules are under the control of each individual organization.
- Education may help employers unsure about flexible work schedules to understand the significant benefits.

Congestion Pricing

A fee system implemented during peak periods. Depending on the size of the fee, drivers have an incentive to shift their travel time, mode, or route. There are five main types of pricing strategies:

1) Variably priced lanes: Variable tolls on separated lanes within a highway, such as express/managed lanes or High Occupancy Toll (HOT) lanes.

2) Variable tolls on entire roadways: Both on toll roads and bridges, as well as on existing toll-free facilities during rush hours.

3) Zone-based (area or cordon) charges: Either variable or fixed charges to drive within or into a congested area within a city.

4) Area-wide charges: Per-mile charges on all roads within an area that may vary by level of congestion.

5) Pricing that does not involve tolls: This includes innovative parking-pricing strategies (e.g., surcharges for entering or exiting a parking facility during or near peak periods) and a range of parking cash-out policies, in which cash is offered to employees in lieu of subsidized parking.

Example

Up to 70 days out of the year, the I-70 corridor opens a managed lane with variable pricing, depending on the amount of congestion. Opening this lane helps reduce congestion and prevent crashes associated with coming to a sudden stop. The lane is only open for a limited time due to space constraints, making the lane unsafe during extreme weather events and when traffic conditions are at free-flow.

Pros

- May increase travel time reliability
- Helps provide funding mechanism for other congestion-managing projects and programs

Cons

- Variably priced lanes, such as express lanes, may encourage SOV travel

Other Factors or Considerations

- High-Occupancy Vehicle travel may be encouraged by offering smaller fees or free travel for vehicles with more than one occupant.

Image Credit: Google, Inc.

Guaranteed Ride Home

Used to encourage ridesharing, the Guaranteed Ride Home service provides a free or inexpensive taxi for emergencies for employees who rideshare.

Example

VanGo™ Vanpool Services provides access to transportation when unscheduled emergencies, illnesses, or schedule changes prevent riders from taking their scheduled van home.

Pros

- Provides more flexibility within vanpooling programs
- Peace-of-mind for vanpoolers in case of emergency or special circumstances

Cons

- May be costly to implement

Other Factors or Considerations

- Guaranteed Ride Home programs vary widely, from the number of available rides per person, to the mechanism for transporting the person, to the cap on reimbursement per ride.
- More robust programs provide greater assurance to vanpoolers but are more costly to implement.

High Occupancy Vehicle (HOV) Lanes

HOV lanes incentivize ridesharing by offering travelers who rideshare a less congested travel lane at reduced or no cost. Though HOV may be paired with an Express/Toll Lane, they may also be implemented as a stand-alone strategy. CDOT's Transportation Commission (TC) sets HOV policy in Colorado.

Example

In Denver, there are HOV lanes on Santa Fe Drive between Littleton and I-25. The HOV restrictions are in effect northbound between 6:00 am and 8:30 am and southbound between 4:00 pm and 6:30 pm.

Pros	Cons
• Provide improved travel time reliability	• HOV users often travel for free, which diminishes the ability for the lane to help pay for itself

Other Factors or Considerations

- HOV lane policies may be for 2+, 3+, 4+, or even 5+.
- HOV users can be difficult to monitor and the lanes challenging to enforce.
- May be coupled with an Express Lane through the use of a switchable HOV transponder.

Ridesharing

Ridesharing is two or more people traveling in a vehicle to their destination.

Example

VanGo™ Vanpool Services accommodates commuters riding to or from similar origins and destinations in the NFRMPO region.

Pros

- Reduces single-occupant vehicle trips
- May significantly shorten travel times if High Occupancy Vehicle (HOV) lanes are available

Cons

- Still encourages vehicle travel

Other Factors or Considerations

- Should be implemented in conjunction with a guaranteed ride home program.
- Designated parking for carpooling or vanpooling proximate to destination may encourage users.
- Park-n-Rides may need to be made available to provide convenient starting locations.

Image Credit: VanGo™ Vanpool Services

Tier 4: Improving Roadway Operations without Expansion, including ITS

Today, roadway operations are driven primarily through advancements in technology, though proper planning and physical projects may play a role as well. Intelligent Transportation System (ITS) strategies use technology to improve mobility, increase safety, and reduce delays. ITS improves the existing roadway system's operations in a cost-effective manner. In addition to locally identified operational improvements, CDOT is currently developing the Smart Mobility Regional Plan, which will identify applications that could be implemented in specific locations or regionwide to improve mobility through technology solutions. The Smart Mobility Regional Plan will replace the previous guiding documents: CDOT Region 4 ITS Architecture Plan and CDOT Region 4 ITS Strategic Implementation Plan.

Tier 4 Strategies include:

- Access Management
- Advanced Traveler Information System
- Automatic Road Enforcement
- Dynamic Parking Management
- Electronic Toll Collection
- Fiber-Optic Communications
- Maintenance Decisions and Support System (MDSS)
- Ramp Metering
- Signage Improvements
- Traffic Operations Center
- Traffic Signal Timing Adjustments
- Transit Signal Priority
- Variable Speed Limits

DATA COLLECTION

Collecting data on traffic conditions, roadway conditions, and system users is a vital component of an efficient and effective transportation system. Data helps communities make informed decisions regarding roadway maintenance and investment priorities and can even feed into other technologies to provide real-time feedback to help maximize performance. Data can also be used to keep travelers informed and safe.

Examples of data used every day in transportation planning include cellular and Bluetooth data, which can record travel times, travel direction and provide information about trip origin/destination. Inductive loop detection, video vehicle detection, and Bluetooth detection can provide accurate counts of vehicles and bicycles using a facility. These technologies can also assist signal timing, alerting signals when users are approaching or at an intersection. More recently, communities have begun investing in fiber-optic networks to help connect the data driven components of the transportation network.

Access Management

Planning and design practices that identify existing and future land use and arterial access points to maximize traffic safety and mobility. Strategies include medians, turn lanes, side/rear access points between businesses, shared access, and local land use ordinances to control access.

Example

The US85 Access Control Plan and subsequent US85 Planning and Environmental Linkages (PEL) Study identify and plan for the safety and operational needs along US Highway 85 between I-76 and the Town of Nunn.

Pros

- Improves safety along managed roadway
- Increases roadway capacity by enabling greater vehicle throughput
- Reduces corridor delay, thus improving travel times

Cons

- Local businesses, residents, and commuters may oppose limiting access to or from developments
- May increase vehicle delay on local streets

Other Factors or Considerations

- Proper access management may enhance the safety and comfort of bicyclists and pedestrians by limiting ingress and egress points that cross bicycle and pedestrian infrastructure.
- Drawbacks of access management may be limited by appropriate site design of adjacent development, including side or rear access and access via transit or biking and walking.

Advanced Traveler Information System

The Advanced Traveler Information Systems applications provide for the collection, aggregation, and dissemination of a wide range of transportation information. The collection of information includes traffic, transit, road weather, and work zone data. Mobile devices, web portals, 511 systems, and variable message signs.

Example

CDOT's COTRIP website (www.cotrip.org) provides travel alerts, road conditions, speeds, and road work advisories for the entire State. Using this website, residents can use the State's available ITS information to choose the best routes, best mode, or view any detours. CDOT also provides a smart phone App, CDOT Mobile, which provides real-time travel information. Travelers can also sign up for text messages and emails which provide similar updates.

Pros

- Helps to optimize the transportation system by allowing drivers to select the best routes
- May prevent secondary crashes caused by unexpectedly stopped traffic

Cons

- Using apps while driving may result in distracted driving
- Difficult to show conditions on all segments of a planned trip passing through multiple jurisdictions

Other Factors or Considerations

- Different apps or websites may be required to display information about roads within different jurisdictions, for example COTRIP only provides information for roads under CDOT's control.

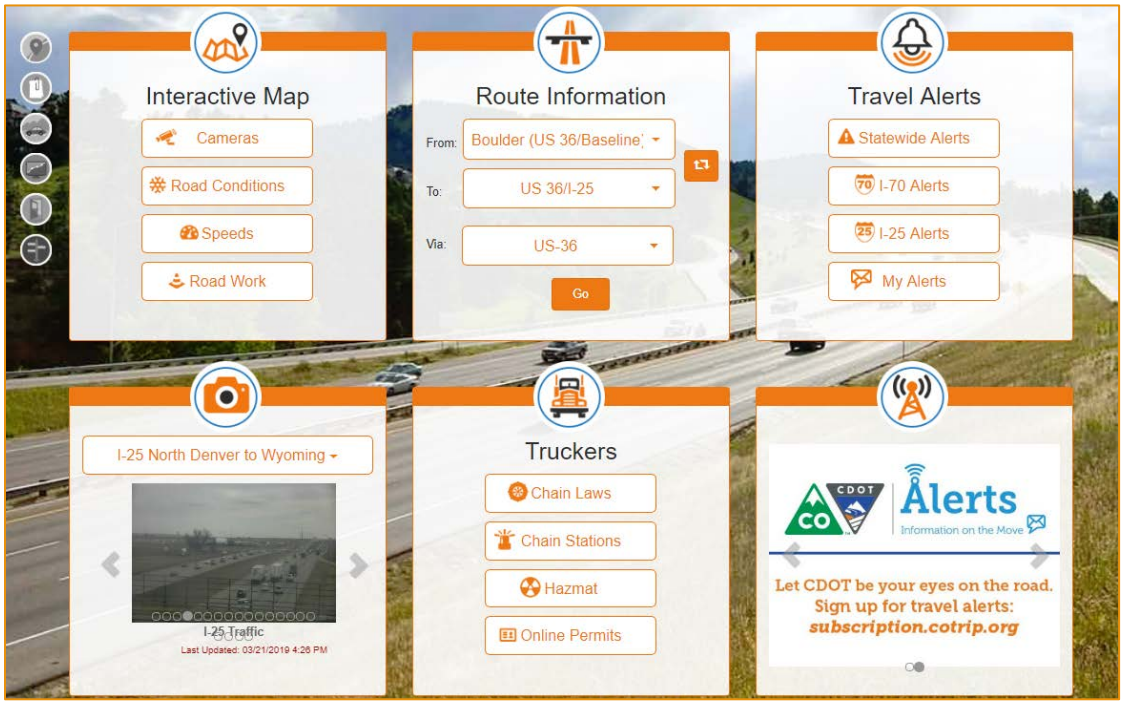


Image Credit: CDOT

Automatic Road Enforcement

A mounted camera used to record and ticket travelers who disobey a speed limit or other legal road requirement and subsequently mail a ticket to their address of record.

Example

Red light cameras mounted at the intersections of Drake Road and College Avenue and Harmony Road and Timberline Road in Fort Collins to help enforce the local speed limits.

Pros

- Encourages safe driving practices
- May reduce intersection crashes

Cons

- Could have political limitations
- Residents and commuters may distrust data collection by camera

Other Factors or Considerations

- Based on current State law, points are not assessed to a person's driver license unless they were moving in excess of 25 miles over the speed limit.

Image Credit: Google, Inc.

Dynamic Parking Management

Parking management notifies travelers of available parking spots, preventing travelers from circulating for extended periods of time looking for parking. Parking management strategies include phone apps and variable sign technology.

Example

Several parking garages on Colorado State University's campus notify travelers of the number of parking spaces remaining.

Pros

- Efficient parking management could prevent congestion in high-traffic areas such as campuses, hospitals, and downtowns

Cons

- In high demand situations, parking spots may be taken by the time travelers arrive at the parking space
- If parking spaces are readily reserved or easy to find, may counteract effects of parking restrictions and pricing

Other Factors or Considerations

- Some parking apps allow travelers to reserve parking spots ahead of time for a nominal fee, further reducing the need to circulate in search of parking.
- Parking management should occur in conjunction with parking restrictions and pricing to prevent an over-reliance on available parking spaces.

Image Credit: Coloradoan

Electronic Toll Collection

Uses a camera to record vehicle license plate numbers and subsequently mail a bill or an in-vehicle radio-frequency identification (RFID) sensor to charge a toll.

Example

Tolls along E-470 in Denver allow vehicles to move quickly through the express lane.

Pros

- Prevents queuing around toll locations
- Significant cost-savings compared to staffed toll booths

Cons

- Initial investment in electronic toll collection is expensive

Other Factors or Considerations

- Limited ability for application.
- Should be considered in conjunction with all toll-lane projects.
- Toll passes may be more cost effective.

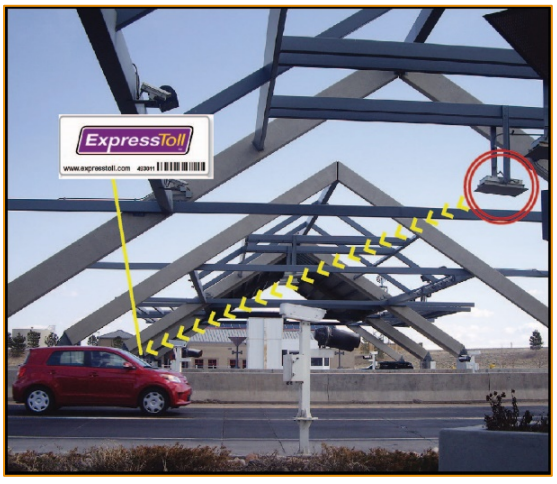


Image Credit: CDOT

Fiber-Optic Communications

Use pulses of light through an optical fiber to carry information for still and live feed cameras, transfer data to and from Traffic Operations Centers and between traffic signals where adaptive technologies have been installed, and connect to the permanent Variable Message Signs (VMS). In the future, fiber will enable Vehicle-to-Everything (V2X) connected vehicle technology, allowing communication between connected vehicles and surrounding environment. V2X encompasses V2V (Vehicle-to-Vehicle), V2I (Vehicle-to-Infrastructure), V2N (Vehicle-to-Network), V2D (Vehicle-to-Device) and V2G (Vehicle-to-Grid).

Example

CDOT has installed fiber along North I-25 and US34 and is continuing to expand the connected vehicle environment along North I-25.

Pros

- Fiber is more resilient than other communication technologies and is not as susceptible to interference or failure as its wireless counterparts

Cons

- Can be expensive to install
- With rapidly changing technology, investments may become outdated

Other Factors or Considerations

- Roadway and utility projects that require digging up existing infrastructure should consider implementing fiber at time of construction to lower the cost of implementing fiber.

Image Credit: Google, Inc.

Maintenance Decisions Support System (MDSS)

A computer-based tool employed by road operating agencies to provide recommendations on road maintenance courses of action based on corridor-specific historical, current, and forecasted road and weather data. Recommendations can include treatment type and amount of material, optimal application times, short-term incident management strategies for quick response, and closures or advisories. MDSS also provide training opportunities for maintenance personnel using historical event playbacks.

Example

CDOT uses friction sensors on vehicles to assess pavement temperature changes, level of friction, and moisture. The vehicle sensor information feeds into the MDSS, an online weather and road condition prediction system, which then identifies sections of roadway that require snow and ice treatment. MDSS improves safety, reliability, and mobility while minimizing maintenance resource waste.

Pros

- Reduces cost of labor, materials, and equipment
- Improves safety
- Reduces response time
- Provides training opportunity for new and experienced maintenance staff
- Improves collaboration within and between agencies

Cons

- Can be costly to implement the system and maintain data, operating, and hosting agreements
- System implementation may require shifts in organizational and management structures
- System may rely on data not currently collected by an agency

Other Factors or Considerations

- One system may be able to serve multiple agencies and/or MDSS outputs may help inform strategies for agencies not actively using the system.
- Analyzing effectiveness of MDSS recommendations and learning system biases and tendencies are key to calibrating the system.

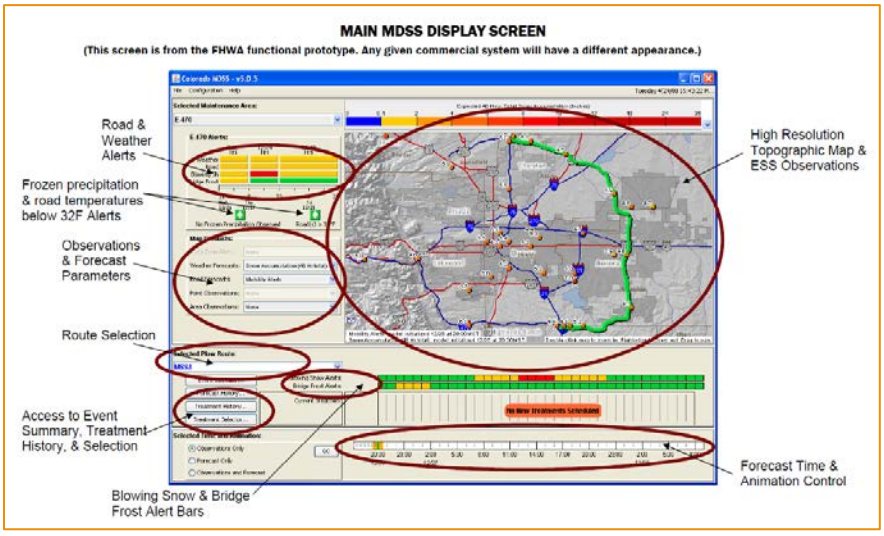


Image credit: FHWA – a functional prototype MDSS interface for Colorado

Ramp Metering

Traffic signals installed on freeway on-ramps to manage the rate of vehicles entering the freeway. Vehicles wait at a designated stop line for a green light that releases individual vehicles into mainline traffic. The signal releases vehicles based on the freeway traffic volume and current speed to minimize stoppages and slowdowns cause by merging and weaving. Volume and speed information are collected by detectors in the mainline freeway pavement.

Example

CDOT has installed ramp meters along I-25 on the southbound Harmony Road on-ramp and the northbound and southbound SH392/Carpenter Road on-ramps at a cost of $400,000.

Pros

- Increased mainline speeds and decreased travel times
- Decreased rear-end and side crashes
- Emission reductions

Cons

- Installation can be very expensive

Other Factors or Considerations

- A ramp meter feasibility study by CDOT found all ramps on I-25 from Johnstown to Fort Collins could use ramp meters.

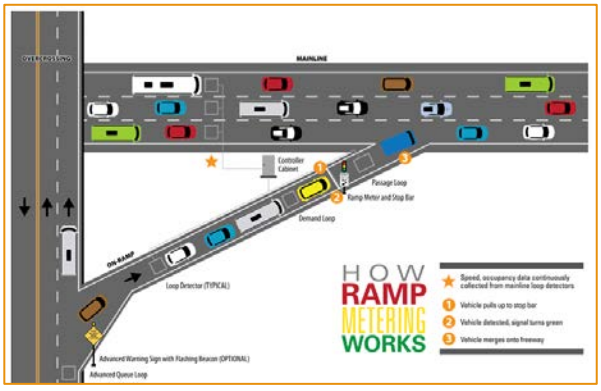


Image credit: FHWA, Google, Inc.

Signage Improvement

Additional signage, signage upgrades, or removal of non-essential signs can facilitate the route-finding and decision-making ability of roadway users.

Example

Signs along I-25 remind drivers to "State Law: Keep Right, Except to Pass" to maintain traffic flow for faster moving vehicles, reducing unnecessary slowdowns and platoons. Other signs along I-25 provide carpool and vanpool informational phone numbers to promote alternative transportation options.

Pros

- Signage installation is relatively low-cost
- Signage allows users to make more informed decisions with ample time to react and provides reminders of ways to keep traffic moving safely and efficiently

Cons

- Too much or poorly placed additional signage can create a chaotic environment and/or go unnoticed

Other Factors or Considerations

- Refer to the Manual on Uniform Traffic Control Devices (MUTCD) for minimum standards and guidance on uniformity of messages, locations, sizes, shape, colors, and more.

Image credit: Google, Inc.

Traffic Operations Center (TOC)

A central command center which allows traffic engineers to monitor traffic signals, closed-circuit television (CCTV), and remote data sensors to analyze and manage traffic in real-time.

Example

The cities of Fort Collins, Greeley, and Loveland each have a TOC.

Pros

- Traffic engineers can monitor the transportation system, update driver information via variable message signs (VMS), modify signal timings, and troubleshoot many signal malfunctions remotely in real time
- Changes to signal timing can reduce delays, travel times, and emissions

Cons

- TOCs are costly to implement and maintain

Other Factors or Considerations

- Remote traffic signal control requires installation of communication infrastructure across the system.

Image credit: City of Fort Collins, City of Loveland, City of Greeley

Traffic Signal Timing Adjustments

Adjustments to signal timing patterns are necessary over time as conditions and traffic patterns change. Inadequate timing may result in unecessary idling, delays, and cues, especially at peak times when patterns shift dramatically at certain locations.

Example

Several agencies have installed Adaptive Signal Control Technologies (ASCT) along congested corridors. ASCT changes signal timing based in real time as demand changes. CDOT reported 13 percent and 23 percent drops in travel time on US34 Business and US85 in Greeley, respectively, after ASCT implementation. CDOT has also installed Commercial Vehicle Signal Priority (CVSP) detection devices along US85 to detect by extending the green phase of a signal for approaching commercial vehicles to reduce delay caused by the slow acceleration and deceleration of stopping at red lights and improve safety.

Pros

- Reduces idling, delays, cues, crashes, travel times, and emissions
- Can enhance the pedestrian and bicyclist experience if clearance intervals are extended at dedicated signals

Cons

- Signal timing adjustments can be costly and require new equipment that may be incompatible with existing infrastructure

Other Factors or Considerations:

- Determining need for signal timing adjustments may require a traffic study.
- Reasons to retime signals include land use changes, population growth, traffic growth changes in vehicle classification profiles, incident management, special events, construction work zone or temporary traffic signal, traffic signal equipment change, scheduled or periodic traffic signal retiming, and high crash rates.

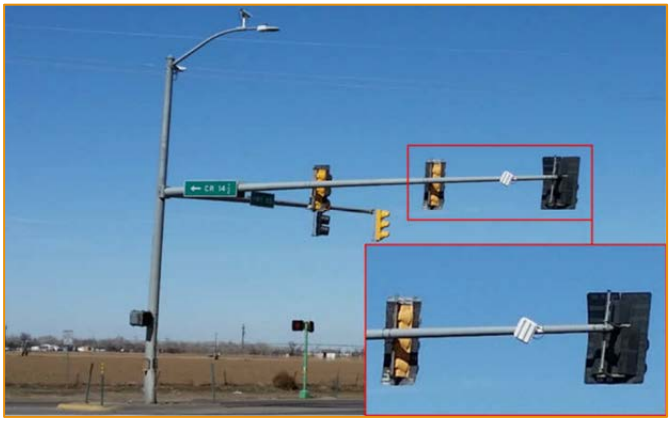


Image credit: CDOT – CVSP, City of Fort Collins – Bicycle Signal

Transit Signal Priority (TSP)

Transit Signal Priority (TSP) tools modify traffic signal timing or phasing when transit vehicles are present either conditionally for late runs or unconditionally for all arriving transit.[11] Queue jump lanes allow transit priority at red traffic signals, meaning the bus will receive a green light prior to general traffic.

Example

Transfort's MAX BRT has signal priority at some intersections along the Mason Corridor.

Pros

- Allows transit services to remain on schedule or to make up time
- Fewer stops can make a more comfortable ride for transit riders
- Can be installed at major intersections, does not need to be installed at each intersection to be useful

Cons

- Requires additional technology for buses and traffic signals
- Can be abused by non-transit vehicles
- Does not help if bus is stuck behind a line of non-transit vehicles
- Could impact traffic on side or cross streets

Other Factors or Considerations

- TSP is predominantly used for BRT but can benefit local buses fitted with the proper technology.
- Need for TSP depends on traffic and transit volumes.
- TSP requires the coordination of traffic engineers, transit staff, and possibly CDOT.

[11] Transit Street Design Guide, National Association of City Transportation Officials, https://nacto.org/publication/transit-street-design-guide/intersections/signals-operations/active-transit-signal-priority/, accessed 3/22/19.

Variable Speed Limits (VSL)

Typically used on interstate highways or high-speed arterials, VSLs leverage data on volume, operating speeds, weather information, sight distance, and roadway surface conditions to digitally post appropriate speed limits.

Example

CDOT has installed VSL signs along I-70 in Glenwood Canyon due to the high number of crashes involving fixed objects, especially during inclement weather.

Pros

- Eliminate or delay bottlenecks
- Reduce crashes associated with slowed traffic on high-speed roadways
- Increase road capacity by decreasing vehicle spacing distances
- Reduced emissions due to less stop-and-go driving

Cons

- Increased maintenance costs
- Driver compliance varies
- Developing VSL algorithms is complicated
- If poorly managed, VSLs can increase variance in speeds

Other Factors or Considerations

- Variable message signs (VMS) are often used to achieve similar objectives by displaying messages such as “Slow Traffic Ahead”.

Image Credit: Google, Inc.

Tier 5: Traffic Incident Management

A traffic incident is any occurrence that impedes the normal flow of traffic on a highway, including crashes, vehicle breakdowns, and spilled loads. According to FHWA:

> *Traffic Incident Management (TIM) consists of a planned and coordinated multi-disciplinary process to detect, respond to, and clear traffic incidents so that traffic flow may be restored as safely and quickly as possible. Effective TIM reduces the duration and impacts of traffic incidents and improves the safety of motorists, crash victims and emergency responders.*[12]

TIM activities are typically categorized into five overlapping functional areas:

1. **Detection and Verification**: the determination that an incident of some type has occurred, and the determination of the precise location and nature of the incident.
2. **Traveler Information**: The communication of incident related information to motorists who are at the scene of the incident, approaching the scene of the incident, or not yet departed from work, home, or other location.
3. **Response**: The activation of a "planned" strategy for the safe and rapid deployment of the most appropriate personnel and resources to the incident scene.
4. **Scene Management and Traffic Control**: the coordination and management of resources and activities at or near the incident scene, including personnel, equipment, and communication links and the process of managing vehicular traffic around the scene of the incident.
5. **Quick Clearance and Recovery**[13]: the safe and timely removal of a vehicle, wreckage, debris, or spilled material from the roadway and the restoration of the roadway to its full capacity.

These functional areas incorporate a number of operational agencies to assist in traffic incident recovery. Typically, the agencies responsible for incident recovery include: CDOT, State and local law enforcement, Fire/EMS, local jurisdictions, coroners, courtesy patrols, and towing/recovery agencies.

IN-VEHICLE TECHNOLOGY

Much of the progress in Traffic Incident Management is being made through in-vehicle technology. Onboard systems are increasingly providing improved travel information, including route options and alerts for hazards. Some vehicles are even equipped with emergency response systems, alerting the proper authorities when the vehicle and driver have been in an accident. As in-vehicle safety systems continue to improve, traditional Traffic Incident Management protocol may change.

[12] Traffic Incident Management. U.S. Department of Transportation. Federal Highway Administration. Emergency Transportation Operations. http://ops.fhwa.dot.gov/eto_tim_pse/about/tim.htm Accessed 3/5/19.
[13] Best Practices in Traffic Incident Management. U.S. Department of Transportation. Federal Highway Administration. Emergency Transportation Operations. September 2010. https://ops.fhwa.dot.gov/publications/fhwahop10050/fhwahop10050.pdf Accessed 3/5/19.

Courtesy Patrol

Service provided to stranded freeway (or tollway) travelers to assist with vehicle breakdowns, stalls and crashes.

Example

CDOT's State Farm Safety Patrol provides limited roadside assistance at no charge. Since 2015, the Safety Patrol has been assisting travelers needing fuel, flat-tire changes, and assistance moving vehicles to the shoulder. The Safety Patrol assists over 30,000 motorists annually.

Pros

- May help reduce secondary crashes
- Reduce the time vehicles are disabled within the right-of-way

Cons

- May be costly to implement

Other Factors or Considerations

- Courtesy patrol programs do not replace emergency responders, but can serve as a stop gap.
- May only be applicable for high-travel corridors with high incident rates.

Image Credit: CDOT

Traffic Incident Management Plans (TIMP)

TIMPs are plans and programs developed to improve the procedural and coordination components of unplanned events on the roadways that impact traffic flow. These events can include stalled vehicles, crashes, hazardous materials incidents, and more. TIMP allows first responders, maintenance and operations crews, and other partners to better communicate and coordinate before, during, and after an incident by standardizing roles and expectations.

Example

CDOT has worked with partners to develop a TIMP for North I-25 in Larimer and Weld counties and is currently developing a TIMP for US85 from the north of the Denver Metropolitan Area to the Colorado-Wyoming border. Each of these TIMPs has resulted in a "Incident Response Manual," consisting of incident levels and associated actions, lists of response agencies, roles and responsibilities of response agencies, contact information and procedures, scene management guidelines, predetermined alternate routes, and resource information.

Pros

- Increased safety at incident sites for motorists and responders
- Reduced traffic flow recovery time after incidents
- Development of a TIMP provides training, networking, and best practice-sharing opportunities for agency staff

Cons

- Requires intensive involvement from many agencies along the corridor

Other Factors or Considerations

- Decisions made during the TIMP development process must consider existing protocols and agreements.

Image credit: CDOT

Tier 6: Roadway Capacity

Though increasing roadway capacity can produce significant reductions in congestion in the short term, these projects are typically extremely costly, can cause congestion during construction, and tend to have a shorter lifetime of proposed benefits.

Tier 6 Strategies include:

- Auxiliary Lanes
- Climbing Lanes
- Grade-Separated Crossings/Intersections
- New Lanes/Roads
- Roundabouts
- Toll/Express Lanes

Auxiliary Lanes

Auxiliary Lanes include turning lanes and deceleration and acceleration lanes. Turn lanes are additional lanes that separate left or right turning vehicles from through-traffic. Deceleration lanes are extensions placed just prior to a freeway exit or intersection turn lane to allow vehicles to reduce speed outside the through-lanes. Acceleration lanes are extensions provided following entrance to the freeway or turn lane onto an arterial street for vehicles to increase speed and merge more smoothly into the through lane.

Example

WCR 49 Expansion project, which spanned from US34 to I-76, includes acceleration lanes along ingress points.

Pros	Cons
• Allows vehicles safe merging onto high-speed highways or slower speed arterials	• May require property acquisition • Auxiliary lanes are costly • Widens intersections, creating a longer distance for pedestrians to cross

Other Factors or Considerations

- Acceleration and deceleration lanes should be made long enough to allow drivers to cover the speed differential from the on or off-ramp.

Climbing Lanes

Additional lanes provided for a short distance, where grade is steep, to allow slower-moving vehicles (e.g. trucks and recreational vehicles) to move to the right, allowing faster-moving vehicles to pass.

Example

In 2016, CDOT constructed a southbound climbing lane on I-25 from south of SH56 to south of Weld County Road 38. The third lane allows large and/or slow moving vehicles to move all the way right during the fairly steep ascent.

Pros

- Relieves congestion caused by slow moving vehicles
- Reduces crashes

Cons

- Merging as the climbing lane ends can cause bottlenecks during peak periods
- Lane additions are costly

Other Factors or Considerations

- Chapter 3 of CDOT's 2005 Roadway Design Guide provides guidance on justification criteria when considering climbing lanes.

Image credit: Muller Engineering

Grade-Separated Crossings/Intersections

A grade-separated intersection is a crossing at which converging facilities are separated vertically, removing the need for a signalized crossing and allowing each facility to flow without interrution. Grade separation for congestion management purposes is commonly used to remove conflicts between automobiles, automobiles and trains, automobiles and bicyclists, automobiles and pedestrians, or some other combination. Grade separation can bring both congestion relief and safety benefits to travelers.

Example

Grade-separated crossings are more common along roadways with higher functional classification, speeds, and volumes. All crossings along I-25 are grade separated. There are several examples of grade-separated intersections along arterial and collector roads in the NFRMPO region. The BNSF railroad passes underneath US34 in Loveland and US287 in Berthoud. Several shared-use paths in Evans, Fort Collins, Greeley, Loveland, Timnath, and Windsor have grade-separated intersections at the roadway network, typically in conjunction with a river.

Pros

- Reduces congestion caused by the presence of signalized intersections
- Reduces crashes by eliminating conflicts between vheicles or vehicles and other travel modes

Cons

- Grade-separated intersections are extremely costly

Other Factors or Considerations

- Where space allows, grade separation for a specific mode of travel may present opportunity to include other modes. For instance, including bicycle lanes and a shared-use path where a road passes under a highway removes a barrier for all users by building just one grade-separated intersection.

Image Credit: Pamela Johnson, Loveland Reporter-Herald; Google, Inc.

New Lanes/Roads

Additional travel lanes on existing roadways or new roadways along separate corridors.

Pros	Cons
• Adds significant short-term capacity • Can connect new areas to activity centers • Accommodates new growth outside of urban core	• Extremely costly to implement • Induces demand on the treated corridor • Growth of population and jobs in the region, leading to an increase in VMT, will further reduce the benefit of project • Long construction times may cause delays • Imposes environmental impacts and requires mitigation

Other Factors or Considerations

- Requires consideration and proof of insufficiency of TDM and/or operational efficiency improvements prior to being incorporated in TIP.

Roundabouts

Roundabouts are yield-controlled intersections, usually circular-, oval-, peanut-, or dogbone-shaped. Traffic enters the roundabout when the coast is clear and travels counterclockwise at slow speeds around a center island. Traffic only stops prior to entering if there is oncoming traffic. When designed properly, roundabouts can safely and efficiently accommodate all travel modes.

Example

Several NFRMPO member agencies have implemented roundabouts. Larimer County constructed a roundabout between Loveland and Berthoud on Larimer County Road 17 (S Taft Avenue / Berthoud Parkway) with two through lanes, bicycle lanes that transition to shared-use paths, pedestrian refuge islands, a wide truck apron, and aesthetically pleasing center island landscaping. The roundabout was built in anticipation of intense development and an associated increase in traffic volume.

Pros

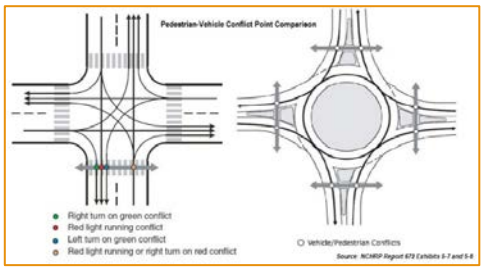
- Reduces conflict points and crashes at intersections (traditional intersections have 32 conflict points; roundabouts have eight conflict points)
- Reduces delay and improves traffic flow
- Higher capacity than traditional intersections
- Less expensive than traditional signalized intersections
- Potentially less space is required at the approaches of a roundabout due to removal of turn lanes

Cons

- The roundabout itself may require more space than a traditional intersection
- Requires educational outreach on benefits and proper use
- Costly to construct

Other Factors or Considerations

- Local agencies often develop informational materials for the public when implementing roundabouts. The City of Fort Collins has published a Roundabout User Guide as well as an informational video.
- If the roundabout is on a route frequented by truck traffic, it is important to incorporate elements such as a truck apron along the center island.



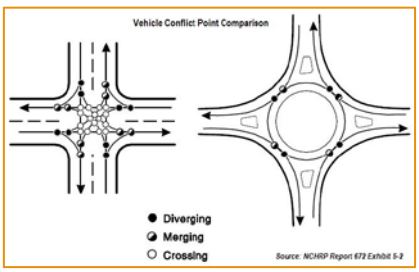


Image credit: Google, Inc.; FHWA

Toll/Express Lanes

New lane or conversion of an existing lane to serve toll paying vehicles; typically, congestion-based or time-based pricing.

Example

I-25 North Express Lanes: Johnstown to Fort Collins, which extends from SH14 south to SH402, will add northbound and southbound express lanes, widening to the middle. Express Lanes in Colorado pair a toll lane and an HOV facility to manage congestion . The Express Lanes allow free travel for buses, motorcycles, and vehicles with three or more people and a switchable HOV transponder.

Pros

- Helps alleviate congestion during peak periods and other periods of high demand
- Could help alleviate recurring and non-recurring congestion
- Tolls may help provide necessary funding to operate

Cons

- Extremely costly to implement
- Induces demand on the treated corridor
- Growth of population and jobs in the region, leading to an increase in VMT, will further reduce the benefit of project
- Long construction times may cause delays

Other Factors or Considerations

- Consider operating in conjunction with Electronic Toll Collection to avoid congestion near tolling location.
- Egress and ingress to and from the express or toll lane should be managed to mitigate the potential for collisions.
- May encourage carpooling by allowing use of a Switchable HOV Transponder for free.

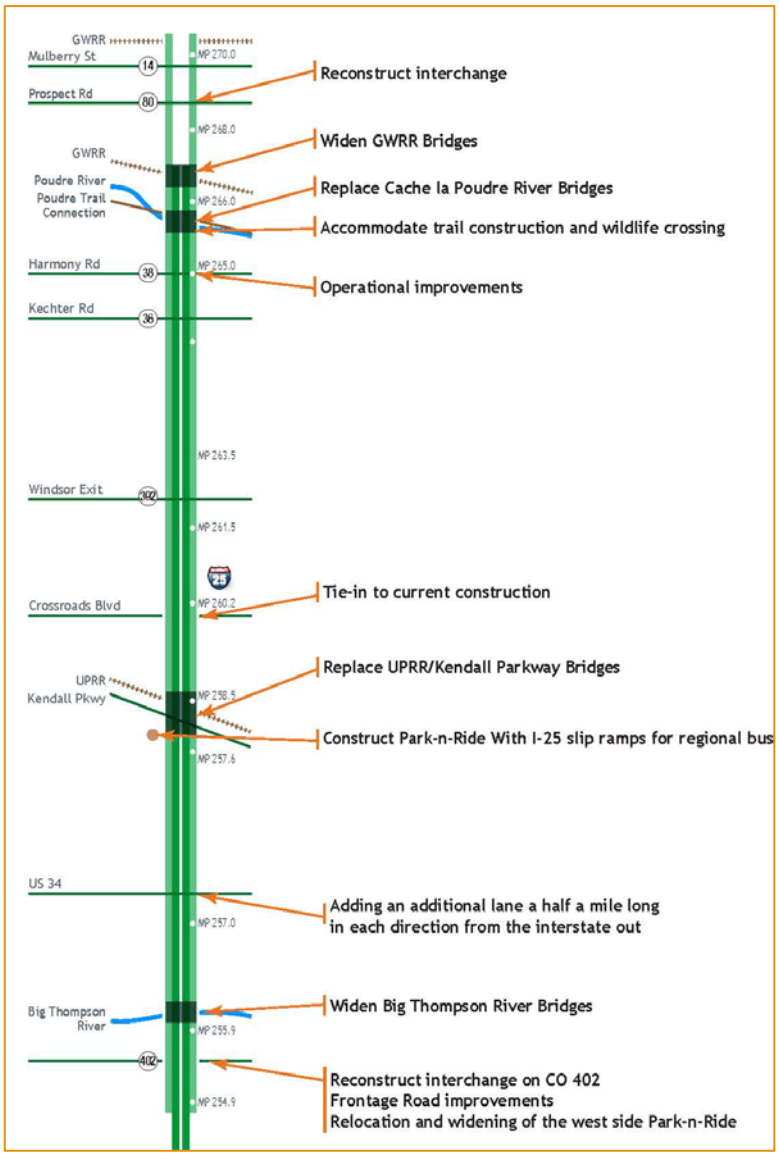


Image Credit: CDOT

Chapter 5: Implementation

This Chapter bridges the gap between the broadly quantified congestion in **Chapter 3** and the congestion-reducing strategies identified in **Chapter 4**. Using regionally supported selection criteria, 15 Congested Corridors were identified. Each Congested Corridor was further analyzed to better understand the potential causes of congestion and to identify opportunities for alleviating congestion along the Corridor. This analysis produced Corridor-specific recommendations for implementing strategies to reduce congestion. Implementation of these recommendations are the responsibility of the jurisdiction(s) owning and/or responsible for maintaining the congested segment(s). Parties responsible are identified within each Congested Corridor Profile.

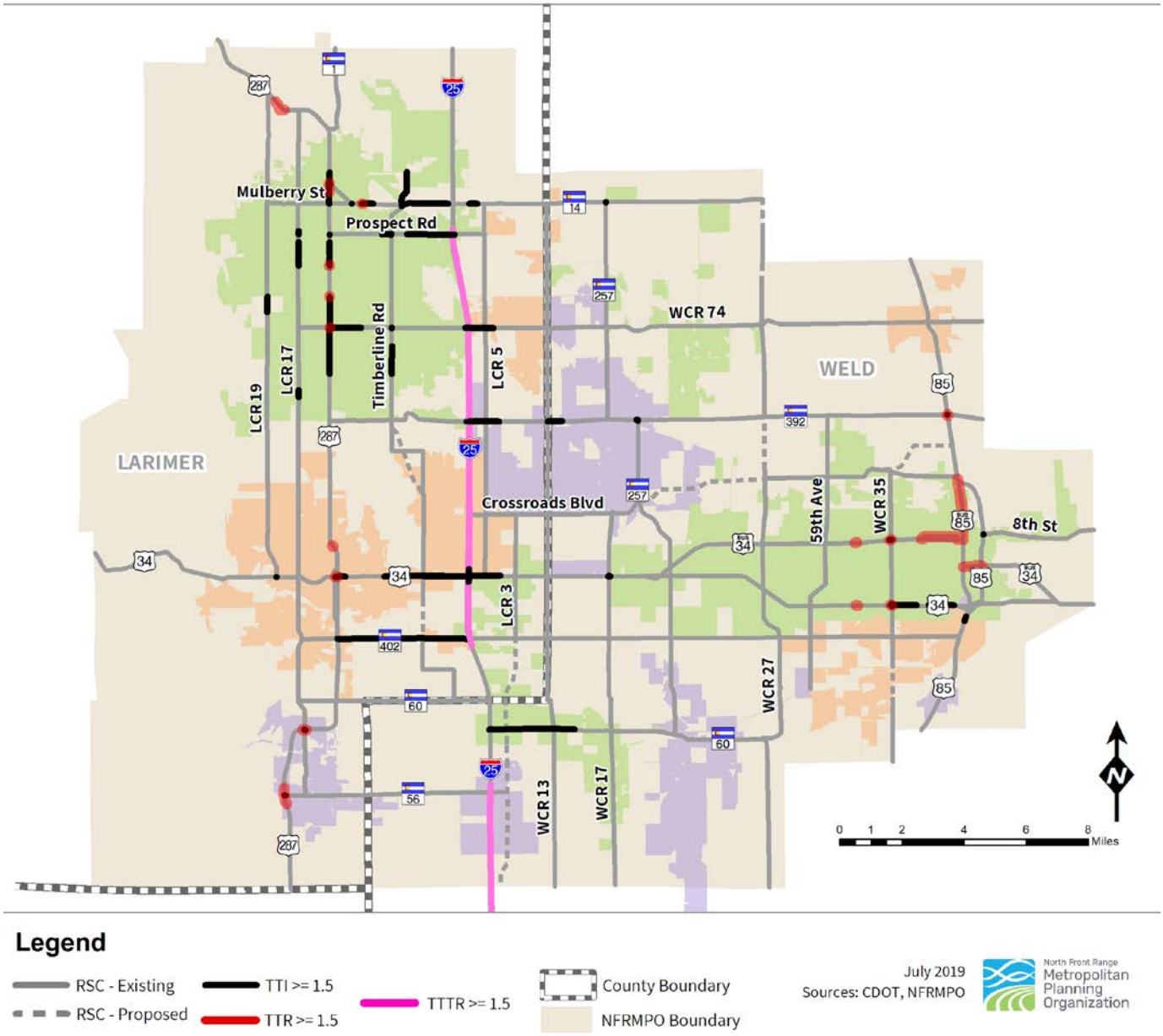
Selecting Congested Corridors

All RSCs identified in **Table 1** from **Chapter 3** were considered as part of this evaluation. A corridor was determined congested if any segment met at least one of the following criteria:

- Travel Time Index (TTI) >= 1.5 for 2018
- Travel Time Reliability (TTR) Index >= 1.5 for 2018
- Truck Travel Time Reliability (TTTR) Index >=1.5 for 2018

While congestion was assessed based on data from 2018, it is also important to consider anticipated congestion along each corridor. The Congested Corridor Profiles identify the percentage of the corridor anticipated to be congested in 2030 and 2045 according to the TTI estimated by the NFRMPO 2015 Base Year Regional Travel Demand Model (RTDM). Forecasting congestion according to the TTR and TTTR measures is not possible, since the RTDM represents travel patterns throughout a typical day and cannot forecast variability from day to day. To provide additional context, the population and number of jobs within ¼ mile of the corridor is provided for 2018, 2030, and 2045 using data from the NFRMPO 2010 Base Year Land Use Allocation Model (LUAM). Evaluating corridors for both current and future years allows the CMP to respond to today's congestion while anticipating future congestion. Since many strategies can take several months or even years to implement, projecting future congestion and proactively programming and implementing strategies may help alleviate future congestion. **Figure 10** displays all congested segments identified in the region.

Figure 10. NFRMPO Congested Corridors



Congested Corridor Analysis and Recommendations

The following section shows the 15 Congested Corridors identified using the criteria previously mentioned. Each page provides a description of the full Corridor, identifies parties responsible for the corridor, maps the congested segments and a selection of implemented strategies along that segment, and provides a comprehensive table of strategies that have been implemented, noted as "Imp," or are planned, noted as "Plan," for the full Corridor.

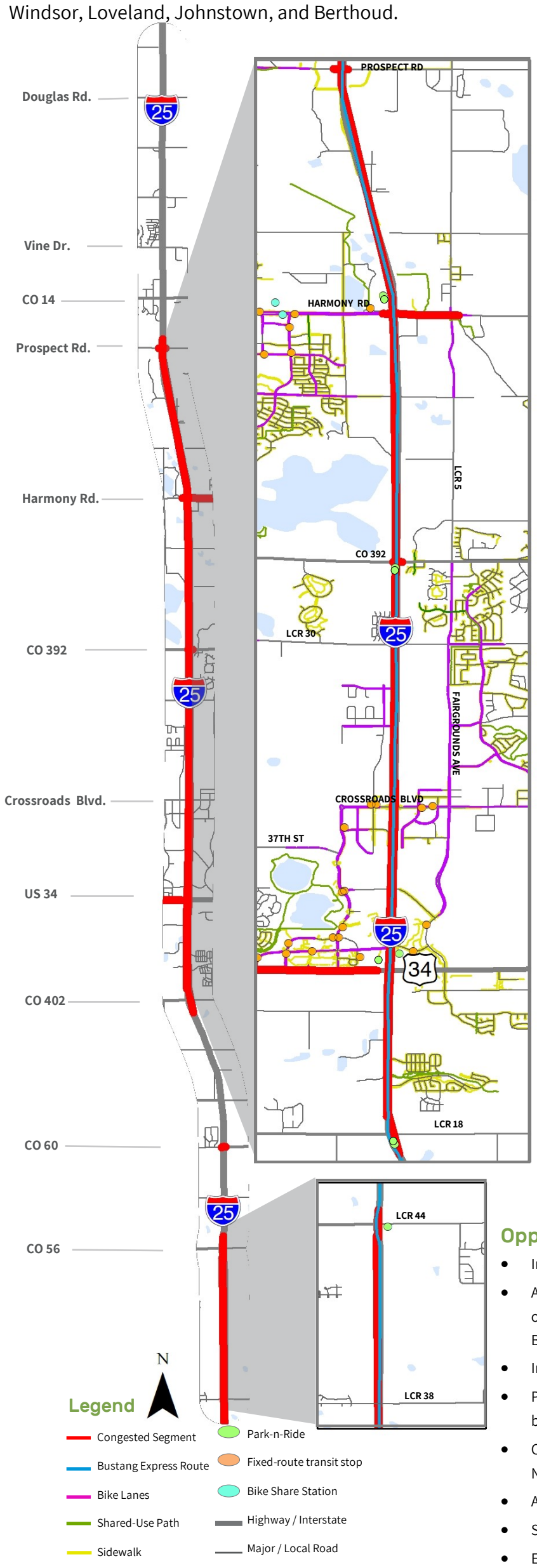
Corridor descriptions reflect the RSC Vision Statements included in the 2045 RTP, helping to further integrate the 2019 CMP into the NFRMPO planning process. The Parties Responsible section of each page identifies the jurisdictions touching any portion of the Corridor. Identifying parties responsible is federally required and should be used as a starting point to identify potential partnerships and opportunities for collaboration.

Strategies from **Chapter 4** were identified as implemented or planned along each corridor with input from the NFRMPO TAC. Only Corridor-specific strategies were considered as part of this analysis. Strategies present or planned anywhere along the Corridor were marked as included in the corresponding Strategies Table. Strategies occurring on parallel or perpendicular corridors did not count as implemented or planned on the Congested Corridor unless the strategy had a direct and measurable impact on the Congested Corridor. For example, RSC #6 (US287) is marked as having Bus Rapid Transit (BRT) to reflect the presence of the MAX bus service along the Mason Corridor, which serves as an alternate option to SOV-travel along portions of US287 in Fort Collins.

The Corridor Visions, the implemented and planned strategies, and the location and type of congestion were used to develop a list of Opportunities, which serve as a recommended blueprint for managing the congestion identified along each Corridor. Each Opportunities section was developed in partnership the NFRMPO TAC and especially with the parties identified as responsible for the Congested Corridor. The opportunities also identify the Regional Non-Motorized Corridors (RNMCs) and Regional Transit Corridors (RTCs) on or adjacent to each corridor. For more information on the RNMCs and RTCs, refer to the 2016 Non-Motorized Plan and the 2045 Regional Transit Element, respectively.

RSC # 1: I-25 Corridor Profile

RSC #1, North Interstate 25, runs through the center of the North Front Range planning area, providing regional, inter-regional, and national connectivity. The corridor is currently two general-purpose lanes in each direction, passing through Fort Collins, Timnath, Windsor, Loveland, Johnstown, and Berthoud.



Metric	2018	2030	2045
Percent of corridor with a TTI >= 1.5	0.4%	21.4 %	15.1%
Percent of corridor with a TTR >= 1.5*	0.0%	-	-
Percent of corridor with a TTTR >= 1.5**	30.5%	-	-
Population living within ¼ mile	3,439	15,276	23,684
Jobs located within ¼ mile	10,097	19,408	24,173

Source: NFRMPO 2015 Regional Travel Demand Model (RTDM), NFRMPO 2010 Land Use Allocation Model, INRIX, NPMRDS
**The TTR metric is only available on the NHS system in 2018*
*** The TTTR metric is only available on the Interstate system in 2018*

	Imp	Plan
Tier 1: Reducing Trip Generation and Shortening Trips		
Efficient Land Use and Development Practices	X	X
Tier 2: Encouraging Shift to Alternative Modes of Transportation		
Bike Infrastructure		X
Bike Share Service		
Bus Rapid Transit		
Car Sharing		
Complete Streets Policies		
Mobility Hubs	X	X
Parking Pricing or Parking Restrictions		
Pedestrian Infrastructure		X
Transit Incentives		
Transit Service Quality Factors		X
Transit Service Quantity Factors	X	
Tier 3: Increasing Vehicle Occupancy and Shifting Travel Times		
Congestion Pricing		
High Occupancy Vehicle (HOV) Lanes		X
Tier 4: Improving Roadway Operations without Expansion		
Access Management	X	
Advanced Traveler Information System	X	
Automatic Road Enforcement		
Dynamic Parking Management		
Electronic Toll Collection		X
Fiber-Optic Communications	X	X
Maintenance Decisions and Support System (MDSS)	X	
Ramp Metering	X	X
Signage Improvements	X	X
Traffic Operations Center	X	
Traffic Signal Timing Adjustments		
Transit Signal Priority		
Variable Speed Limits		
Tier 5: Traffic Incident Management		
Courtesy Patrol	X	
Traffic Incident Management Plan	X	
Tier 6: Road Capacity		
Auxiliary Lanes	X	X
Climbing Lanes	X	
Grade-Separated Crossings/Intersections	X	X
New Lanes/Roads		X
Roundabouts		
Toll/Express Lanes		X

Parties Responsible:

- CDOT
- Larimer County
- Weld County
- Fort Collins
- Timnath
- Windsor
- Loveland
- Johnstown
- Berthoud

Opportunities:

- Implement ramp metering at all on ramps and off-ramps between Johnstown and Fort Collins
- Adaptive Signal Control Technology (ASCT) for all signals along US34 and Crossroads Boulevard within one mile of N I-25 along Mountain Vista Drive, SH14, Prospect Road, Harmony Road, SH392, Crossroads Boulevard, US34, SH402, SH60, and SH56
- Increase Bustang Express Bus frequency
- Partner with COLT, Transfort, and GET on increasing service to Bustang stops and explore other feeder bus service options
- Complete on-road bicycle infrastructure gaps and develop grade-separated bike/ped crossings across N I-25 where feasible
- Add Park-n-Ride capacity where feasible, including SH56
- Study commuter rail options on parallel corridors as identified in the N I-25 EIS
- Expand truck parking and Advanced Traveler Information System (ATIS)
- Relocate on ramp from the Fort Collins Port of Entry
- Continue to implement recommendations from the I-25 Traffic Incident Management Plan (TIMP)
- Complete and maintain infrastructure consistent with Regional Non-Motorized Corridors (RNMCs) 2, 3, 4, 5, 6, 7, and 11
- Implement regional transit service consistent with Regional Transit Corridors (RTCs) 1, 6, 7, 8, 10, and 12

RSC #2: US34 Corridor Profile

The vision for RSC #2 is to increase mobility and to maintain system quality and improve safety. The communities along the RSC also value transportation choices, and connections to other areas. Future travel modes to be planned for include passenger vehicles, bus service, bus rapid transit, truck freight, and bicycles and pedestrians. Transportation Demand Management (TDM) strategies in the urban portions of Loveland and Greeley are important along this RSC. There is transit access to the City of Loveland Transit (COLT) system, the Greeley Evans Transit (GET) system, Bustang, and a Park-n-Ride lot. The transportation system in the area serves towns, cities, and destinations both along and outside of the RSC. Both passenger and freight traffic volumes are expected to increase significantly. The University of Northern Colorado (UNC) and Rocky Mountain National Park contribute to the activity on either end of this RSC. While the majority of the area surrounding the RSC is transitioning from agricultural to suburban, sections of the RSC through Loveland and Greeley are urbanized.

Metric	2018	2030	2045
Percent of corridor with a TTI >= 1.5	17.5%	36.7%	53.8%
Percent of corridor with a TTR >= 1.5*	1.9%	-	-
Population living within ¼ mile	22,799	32,880	48,797
Jobs located within ¼ mile	23,511	32,816	42,552

Source: NFRMPO 2015 Regional Travel Demand Model (RTDM), NFRMPO 2010 Land Use Allocation Model, INRIX, NPMRDS

**The TTR metric is only available on the NHS system in 2018*

	Imp	Plan
Tier 1: Reducing Trip Generation and Shortening Trips		
Efficient Land Use and Development Practices	X	X
Tier 2: Encouraging Shift to Alternative Modes of Transportation		
Bike Infrastructure	X	X
Bike Share Service		
Bus Rapid Transit		
Car Sharing		
Complete Streets Policies		
Mobility Hubs	X	X
Parking Pricing or Parking Restrictions		
Pedestrian Infrastructure	X	X
Transit Incentives		
Transit Service Quality Factors		X
Transit Service Quantity Factors		X

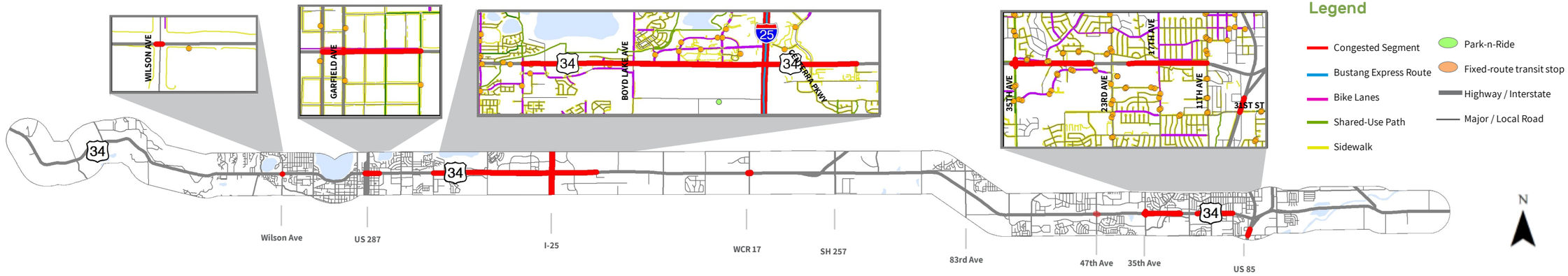
	Imp	Plan
Tier 3: Increasing Vehicle Occupancy and Shifting Travel Times		
Congestion Pricing		
High Occupancy Vehicle (HOV) Lanes		
Tier 4: Improving Roadway Operations without Expansion		
Access Management	X	
Advanced Traveler Information System	X	
Automatic Road Enforcement		
Dynamic Parking Management		
Electronic Toll Collection		
Fiber-Optic Communications	X	X
Maintenance Decisions and Support System (MDSS)	X	
Ramp Metering		
Signage Improvements		
Traffic Operations Center	X	
Traffic Signal Timing Adjustments	X	
Transit Signal Priority		
Variable Speed Limits		
Tier 5: Traffic Incident Management		
Courtesy Patrol		
Traffic Incident Management Plan		
Tier 6: Road Capacity		
Auxiliary Lanes	X	
Climbing Lanes		
Grade-Separated Crossings/Intersections	X	X
New Lanes/Roads		X
Roundabouts		
Toll/Express Lanes		

Opportunities:

- Implement strategies from the US34 PEL
- Expand regional transit connectivity
- Complete and maintain infrastructure consistent with RNMCs 1, 2, 3, 4, 5, 6, 7, and 11
- Implement regional transit service consistent with RTCs 4, 5, 6, 7, 8, 10, 11, and 12
- Study Commercial Vehicle Signal Priority (CVSP) opportunities

Parties Responsible:

- CDOT
- Larimer County
- Weld County
- Loveland
- Windsor
- Johnstown
- Greeley
- Evans
- Garden City



RSC #3: US34 Business Route Corridor Profile

The vision for RSC #3 is to increase mobility as well as to maintain system quality and improve safety. To account for increasing passenger volumes, future travel modes to be planned for include passenger vehicles, bus service, and bicycles and pedestrians. Users of this RSC support the movement of tourists, commuters, freight, and farm-to-market products while recognizing the environmental, economic, and social needs of the surrounding area. This corridor has access to the GET transit system and is a major west-east arterial for Greeley.

Metric	2018	2030	2045
Percent of corridor with a TTI >= 1.5	0.5%	17.5%	34.6%
Percent of corridor with a TTR >= 1.5*	11.7%	-	-
Population living within ¼ mile	17,218	18,178	24,312
Jobs located within ¼ mile	18,819	19,421	22,677

Source: NFRMPO 2015 Regional Travel Demand Model (RTDM), NFRMPO 2010 Land Use Allocation Model, INRIX, NPMRDS

**The TTR metric is only available on the NHS system in 2018*

	Imp	Plan
Tier 1: Reducing Trip Generation and Shortening Trips		
Efficient Land Use and Development Practices	X	X
Tier 2: Encouraging Shift to Alternative Modes of Transportation		
Bike Infrastructure		X
Bike Share Service		
Bus Rapid Transit		
Car Sharing		
Complete Streets Policies		
Mobility Hubs	X	
Parking Pricing or Parking Restrictions		
Pedestrian Infrastructure	X	
Transit Incentives	X	
Transit Service Quality Factors	X	
Transit Service Quantity Factors	X	
Tier 3: Increasing Vehicle Occupancy and Shifting Travel Times		
Congestion Pricing		
High Occupancy Vehicle (HOV) Lanes		

	Imp	Plan
Tier 4: Improving Roadway Operations without Expansion		
Access Management	X	
Advanced Traveler Information System	X	
Automatic Road Enforcement		
Dynamic Parking Management		
Electronic Toll Collection		
Fiber-Optic Communications	X	X
Maintenance Decisions and Support System (MDSS)	X	
Ramp Metering		
Signage Improvements	X	
Traffic Operations Center	X	
Traffic Signal Timing Adjustments	X	
Transit Signal Priority		X
Variable Speed Limits		
Tier 5: Traffic Incident Management		
Courtesy Patrol		
Traffic Incident Management Plan		
Tier 6: Road Capacity		
Auxiliary Lanes	X	
Climbing Lanes		
Grade-Separated Crossings/Intersections	X	
New Lanes/Roads		
Roundabouts		
Toll/Express Lanes		

Opportunities:

- Continue to improve operations through signal timing adjustments
- Consider additional auxiliary lanes
- Implement incident management strategies
- Consider adopting a Complete Streets policy
- Implement dynamic parking management where feasible
- Complete and maintain infrastructure consistent with RNMC 10
- Implement regional transit service consistent with RTCs 8, 10, and 11
- Consider implementing Bus Rapid Transit (BRT)

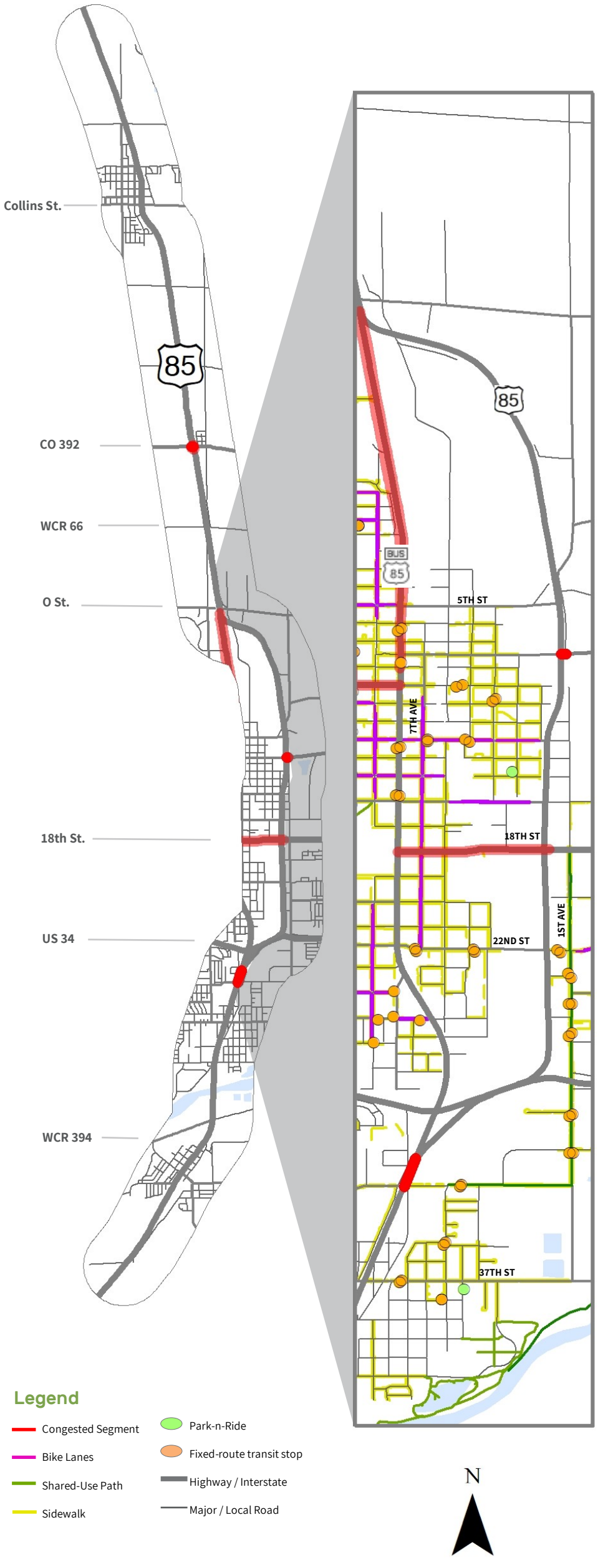
Parties Responsible:

- CDOT
- Weld County
- Greeley

RSC # 4: US85 Corridor Profile

The vision for RSC #4 is to increase mobility, maintain system quality and improve safety. Future travel modes to be planned for include passenger vehicles, bus service, truck freight, and freight rail. As both passenger and freight traffic volumes are expected to increase, TDM could be effective along this RSC. Users of the RSC support the movement of commuters, freight, farm-to-market products, and hazardous materials while recognizing the environmental, economic, and social needs of the surrounding area.

The transportation system in the area primarily serves towns, cities, and destinations in the surrounding area, characterized by manufacturing, agriculture, commercial activity, and oil and gas activity, with main street characteristics through Eaton and LaSalle. RSC #4 provides interregional connections to the Denver metropolitan area to the south and Wyoming to the north, is part of the National Highway System (NHS), and is a segment of the international CanAm Highway extending from Mexico to Canada.



Metric	2018	2030	2045
Percent of corridor with a TTI >= 1.5	1.4%	2.5%	9.0%
Percent of corridor with a TTR >= 1.5*	9.8%	-	-
Population living within ¼ mile	7,444	8,412	8,504
Jobs located within ¼ mile	10,908	11,671	13,965

Source: NFRMPO 2015 Regional Travel Demand Model (RTDM), NFRMPO 2010 Land Use Allocation Model, INRIX, NPMRDS

**The TTR metric is only available on the NHS system in 2018*

	Imp	Plan
Tier 1: Reducing Trip Generation and Shortening Trips		
Efficient Land Use and Development Practices	X	X
Tier 2: Encouraging Shift to Alternative Modes of Transportation		
Bike Infrastructure		X
Bike Share Service		
Bus Rapid Transit		
Car Sharing		
Complete Streets Policies		
Mobility Hubs	X	
Parking Pricing or Parking Restrictions		
Pedestrian Infrastructure		X
Transit Incentives		
Transit Service Quality Factors		
Transit Service Quantity Factors		
Tier 3: Increasing Vehicle Occupancy and Shifting Travel Times		
Congestion Pricing		
High Occupancy Vehicle (HOV) Lanes		
Tier 4: Improving Roadway Operations without Expansion		
Access Management	X	
Advanced Traveler Information System	X	
Automatic Road Enforcement		
Dynamic Parking Management	X	X
Electronic Toll Collection		
Fiber-Optic Communications		X
Maintenance Decisions and Support System (MDSS)	X	
Ramp Metering		
Signage Improvements		
Traffic Operations Center	X	
Traffic Signal Timing Adjustments	X	
Transit Signal Priority		X
Variable Speed Limits		
Tier 5: Traffic Incident Management		
Courtesy Patrol		
Traffic Incident Management Plan	X	
Tier 6: Road Capacity		
Auxiliary Lanes	X	
Climbing Lanes		
Grade-Separated Crossings/Intersections	X	
New Lanes/Roads		
Roundabouts		
Toll/Express Lanes		

Opportunities:

- Implement strategies from the US 85 PEL
- Expand inter-regional transit connectivity
- Implement US 85 TIMP recommendations
- Incorporate VMS at strategic locations
- Complete and maintain infrastructure consistent with RNMC 1 ,4, 6, 10, and 11
- Implement regional transit service consistent with RTCs 1, 5, and 11
- Study Commercial Vehicle Signal Priority (CVSP) opportunities

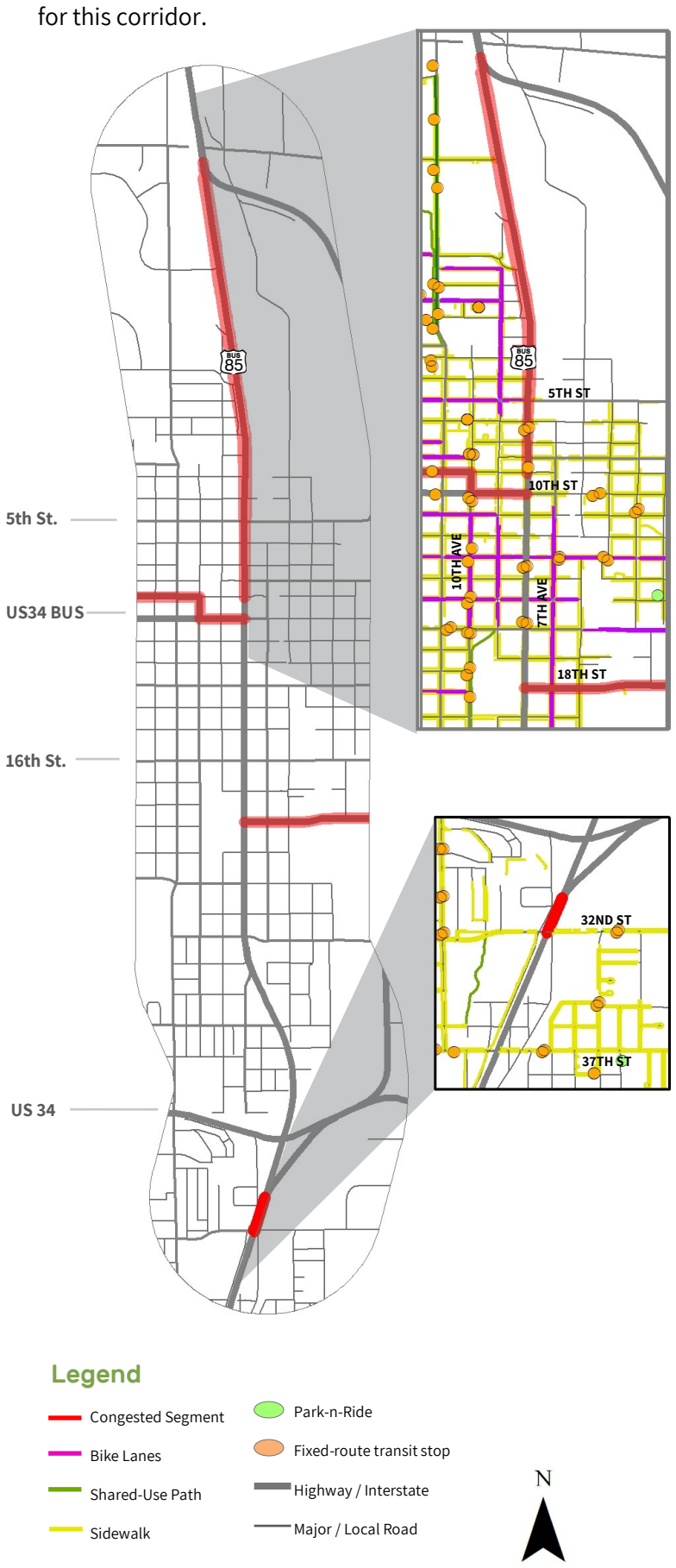
Parties Responsible:

- CDOT
- Weld County
- Eaton
- Greeley
- Evans
- Garden City
- Lasalle

RSC # 5: US85 Business Route Corridor Profile

The vision for RSC #5 is to increase mobility as well as to maintain system quality and improve safety as both passenger and freight traffic volumes are expected to increase. Users of the RSC support the movement of commuters, freight, farm-to-market products, and hazardous materials to and through the RSC while recognizing the environmental, economic, and social needs of the surrounding area.

The corridor is characterized by manufacturing, agriculture, commercial activity, and oil and gas activity, with main street characteristics through Greeley. The area surrounding this RSC is diverse and includes urban characteristics through the Greeley area. There is access to the GET transit system for this corridor.



Metric	2018	2030	2045
Percent of corridor with a TTI >= 1.5	0.0%	1.4%	1.4%
Percent of corridor with a TTR >= 1.5*	0.0%	-	-
Population living within ¼ mile	8,732	8,916	9,013
Jobs located within ¼ mile	21,445	21,634	24,167

Source: NFRMPO 2015 Regional Travel Demand Model (RTDM), NFRMPO 2010 Land Use Allocation Model, INRIX, NPMRDS

**The TTR metric is only available on the NHS system in 2018*

	Imp	Plan
Tier 1: Reducing Trip Generation and Shortening Trips		
Efficient Land Use and Development Practices	X	X
Tier 2: Encouraging Shift to Alternative Modes of Transportation		
Bike Infrastructure		
Bike Share Service	X	
Bus Rapid Transit		
Car Sharing		
Complete Streets Policies		
Mobility Hubs		
Parking Pricing or Parking Restrictions		
Pedestrian Infrastructure	X	
Transit Incentives	X	
Transit Service Quality Factors	X	
Transit Service Quantity Factors	X	
Tier 3: Increasing Vehicle Occupancy and Shifting Travel Times		
Congestion Pricing		
High Occupancy Vehicle (HOV) Lanes		
Tier 4: Improving Roadway Operations without Expansion		
Access Management	X	
Advanced Traveler Information System	X	
Automatic Road Enforcement		
Dynamic Parking Management	X	
Electronic Toll Collection		
Fiber-Optic Communications		
Maintenance Decisions and Support System (MDSS)	X	
Ramp Metering		
Signage Improvements	X	
Traffic Operations Center	X	
Traffic Signal Timing Adjustments	X	
Transit Signal Priority		X
Variable Speed Limits		
Tier 5: Traffic Incident Management		
Courtesy Patrol		
Traffic Incident Management Plan		
Tier 6: Road Capacity		
Auxiliary Lanes	X	
Climbing Lanes		
Grade-Separated Crossings/Intersections	X	
New Lanes/Roads		
Roundabouts		
Toll/Express Lanes		

Opportunities:

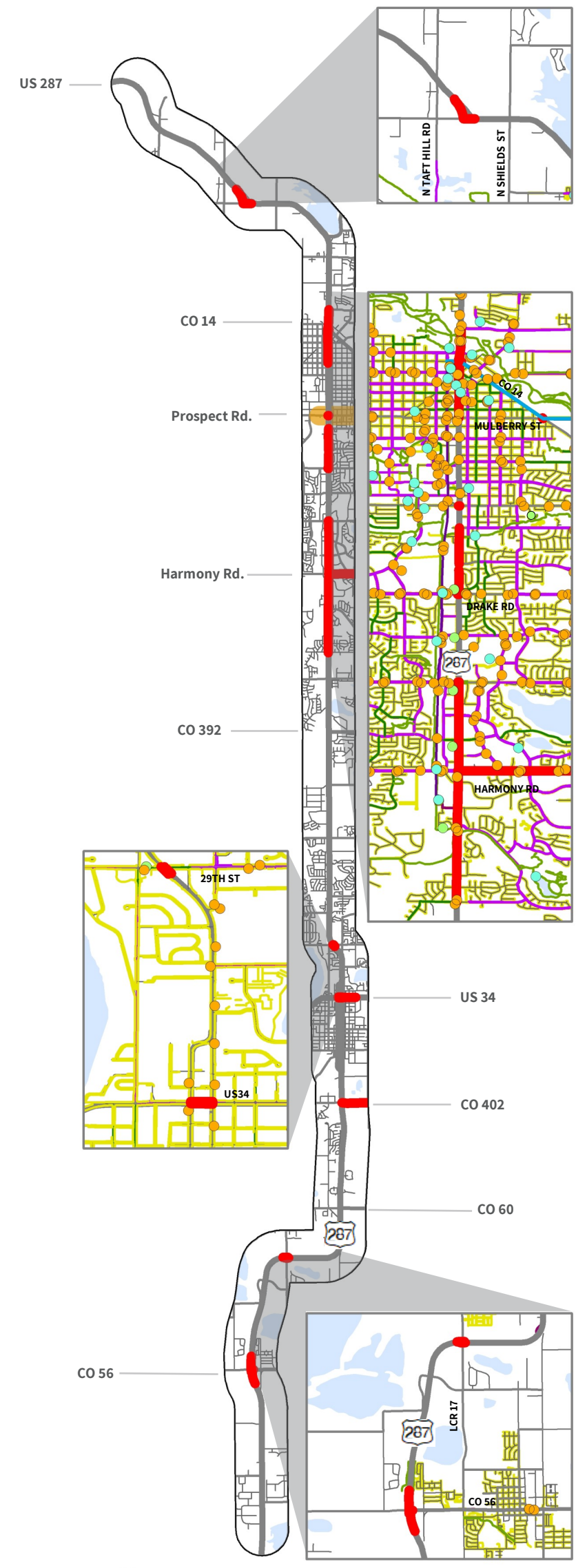
- Improve access management
- Expand dynamic parking management
- Upgrade transit service
- Complete and maintain infrastructure consistent with RNMCs 6 and 11
- Implement regional transit service consistent with RTCs 5 and 11

Parties Responsible:

- CDOT
- Weld County
- Greeley
- Evans

RSC # 6: US287 Corridor Profile

The vision for RSC #6 is to increase mobility, maintain system quality, and improve safety as both passenger and freight traffic volumes are expected to increase significantly. Users of this RSC want to retain the character of the area, including the dedicated open space between Fort Collins and Loveland, while supporting the movement of commuters and freight to and through the RSC.



This RSC provides north-south connections within Fort Collins, Loveland, and Berthoud and connections south to the Denver metropolitan area and north to Laramie, Wyoming and I-80. US287 is an NHS facility and acts as a main street through both Fort Collins and Loveland and is an important corridor to both the COLT and Transfort transit systems.

Metric	2018	2030	2045
Percent of corridor with a TTI >= 1.5	16.7%	10.4%	15.7%
Percent of corridor with a TTR >= 1.5*	2.1%	-	-
Population living within ¼ mile	27,186	31,532	35,506
Jobs located within ¼ mile	45,125	44,436	49,972

Source: NFRMPO 2015 Regional Travel Demand Model (RTDM), NFRMPO 2010 Land Use Allocation Model, INRIX, NPMRDS
**The TTR metric is only available on the NHS system in 2018*

	Imp	Plan
Tier 1: Reducing Trip Generation and Shortening Trips		
Efficient Land Use and Development Practices	X	X
Tier 2: Encouraging Shift to Alternative Modes of Transportation		
Bike Infrastructure	X	X
Bike Share Service	X	X
Bus Rapid Transit	X	X
Car Sharing	X	
Complete Streets Policies	X	
Mobility Hubs	X	
Parking Pricing or Parking Restrictions	X	
Pedestrian Infrastructure	X	X
Transit Incentives	X	
Transit Service Quality Factors	X	X
Transit Service Quantity Factors	X	X
Tier 3: Increasing Vehicle Occupancy and Shifting Travel Times		
Congestion Pricing		
High Occupancy Vehicle (HOV) Lanes		
Tier 4: Improving Roadway Operations without Expansion		
Access Management	X	
Advanced Traveler Information System	X	
Automatic Road Enforcement	X	
Dynamic Parking Management	X	
Electronic Toll Collection		
Fiber-Optic Communications	X	
Maintenance Decisions and Support System (MDSS)	X	
Ramp Metering		
Signage Improvements	X	
Traffic Operations Center	X	
Traffic Signal Timing Adjustments	X	
Transit Signal Priority	X	
Variable Speed Limits		
Tier 5: Traffic Incident Management		
Courtesy Patrol		
Traffic Incident Management Plan		
Tier 6: Road Capacity		
Auxiliary Lanes	X	
Climbing Lanes		
Grade-Separated Crossings/Intersections	X	
New Lanes/Roads		
Roundabouts		
Toll/Express Lanes		

Opportunities:

- Conduct ADA compliance review
- Improve bicycle and pedestrian facilities
- Complete and maintain infrastructure consistent with RNMCs 2, 3, 4, 5, 6, 7, 8, and 11
- Implement regional transit service consistent with RTCs 1, 2, 4, 6, 9, and 12
- Study Commercial Vehicle Signal Priority (CVSP) opportunities

Parties Responsible:

- CDOT
- Larimer County
- Fort Collins
- Loveland
- Berthoud

RSC #8: SH14 Corridor

The vision for RSC #8 is to increase mobility as well as to maintain system quality and improve safety. The communities along this RSC also value transportation choices and connections to other areas. As passenger and freight traffic volumes increase, travel modes to be planned for include passenger vehicles, bus service, truck freight, and bicycles and pedestrians. TDM would likely be effective along this RSC. Users of this RSC support the movement of commuters, freight and hazardous materials while recognizing the environmental, economic, and social needs of the surrounding area. Future annexation and development will enhance the urban and suburban character of the corridor. Part of the NHS, this RSC is currently used as a connection for interregional and interstate freight and travelers to and from I-25 (RSC #1), US287 (RSC #6), and I-80. This RSC is an important route for the Transfort system.

Metric	2018	2030	2045
Percent of corridor with a TTI >= 1.5	12.5%	52.6%	80.1%
Percent of corridor with a TTR >= 1.5*	0.0%	-	-
Population living within ¼ mile	4,582	5,852	10,844
Jobs located within ¼ mile	13,316	13,434	14,986

Source: NFRMPO 2015 Regional Travel Demand Model (RTDM), NFRMPO 2010 Land Use Allocation Model, INRIX, NPMRDS

**The TTR metric is only available on the NHS system in 2018*

	Imp	Plan
Tier 1: Reducing Trip Generation and Shortening Trips		
Efficient Land Use and Development Practices	X	X
Tier 2: Encouraging Shift to Alternative Modes of Transportation		
Bike Infrastructure	X	X
Bike Share Service		
Bus Rapid Transit		
Car Sharing		
Complete Streets Policies	X	
Mobility Hubs		
Parking Pricing or Parking Restrictions		
Pedestrian Infrastructure	X	X
Transit Incentives	X	
Transit Service Quality Factors	X	
Transit Service Quantity Factors	X	

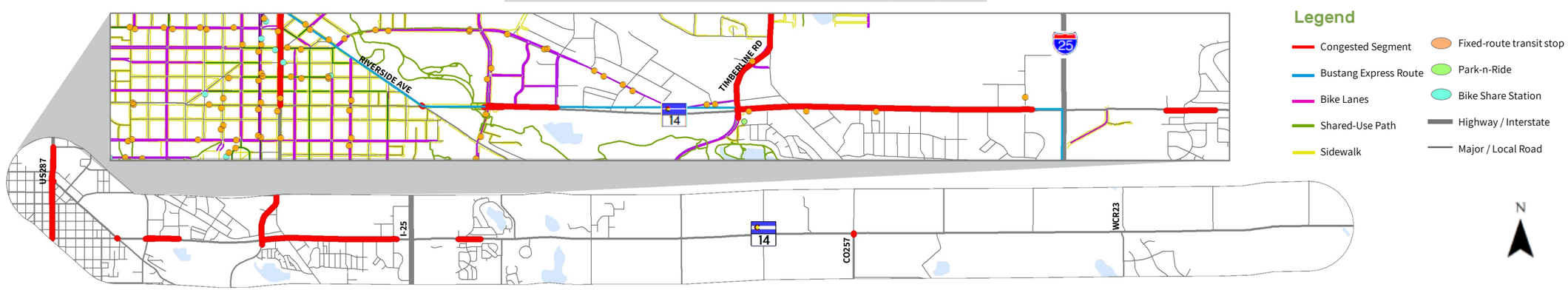
	Imp	Plan
Tier 3: Increasing Vehicle Occupancy and Shifting Travel Times		
Congestion Pricing		
High Occupancy Vehicle (HOV) Lanes		
Tier 4: Improving Roadway Operations without Expansion		
Access Management	X	
Advanced Traveler Information System	X	
Automatic Road Enforcement		
Dynamic Parking Management		
Electronic Toll Collection		
Fiber-Optic Communications		X
Maintenance Decisions and Support System (MDSS)	X	
Ramp Metering		
Signage Improvements		
Traffic Operations Center		
Traffic Signal Timing Adjustments	X	
Transit Signal Priority		
Variable Speed Limits		
Tier 5: Traffic Incident Management		
Courtesy Patrol		
Traffic Incident Management Plan		
Tier 6: Road Capacity		
Auxiliary Lanes	X	
Climbing Lanes		
Grade-Separated Crossings/Intersections	X	X
New Lanes/Roads		X
Roundabouts		X
Toll/Express Lanes		

Opportunities:

- Study grade separation opportunities
- Study Commercial Vehicle Signal Priority (CVSP) opportunities
- Complete and maintain infrastructure consistent with RNMCs 6 and 7
- Implement regional transit service consistent with RTCs 2, 3, 6, and 9

Parties Responsible:

- CDOT
- Larimer County
- Weld County
- Fort Collins
- Timnath
- Severance



RSC #10: SH60 Corridor

The vision for RSC #10 is to maintain system quality and improve safety as both passenger and freight traffic volumes are expected to increase. Future travel modes to be planned for include passenger vehicle, bus service, and truck freight. Users of this RSC want to support the movement of commuters and freight to and through the RSC while recognizing the environmental, economic, and social needs of the surrounding area. TDM investment throughout portions of Johnstown and Milliken provide important connections along this corridor. The area surrounding this RSC is transitioning from agricultural to suburban. The RSC provides local area-wide access to higher functional class facilities and makes west-east connections within and between Johnstown, Milliken, and Berthoud.

Metric	2018	2030	2045
Percent of corridor with a TTI >= 1.5	13.9%	54.9%	88.0%
Population living within ¼ mile	8,582	9,503	11,357
Jobs located within ¼ mile	3,005	3,372	4,596

Source: NFRMPO 2015 Regional Travel Demand Model (RTDM), NFRMPO 2010 Land Use Allocation Model, INRIX

	Imp	Plan
Tier 1: Reducing Trip Generation and Shortening Trips		
Efficient Land Use and Development Practices		
Tier 2: Encouraging Shift to Alternative Modes of Transportation		
Bike Infrastructure	X	X
Bike Share Service		
Bus Rapid Transit		
Car Sharing		
Complete Streets Policies		
Mobility Hubs		
Parking Pricing or Parking Restrictions		
Pedestrian Infrastructure	X	X
Transit Incentives		
Transit Service Quality Factors		
Transit Service Quantity Factors		
Tier 3: Increasing Vehicle Occupancy and Shifting Travel Times		
Congestion Pricing		
High Occupancy Vehicle (HOV) Lanes		

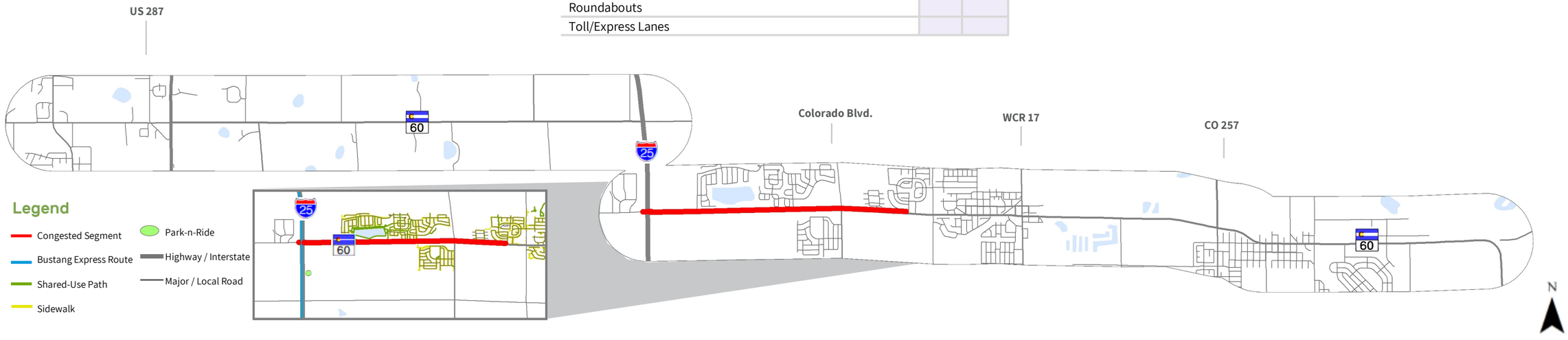
	Imp	Plan
Tier 4: Improving Roadway Operations without Expansion		
Access Management	X	
Advanced Traveler Information System		
Automatic Road Enforcement		
Dynamic Parking Management		
Electronic Toll Collection		
Fiber-Optic Communications		X
Maintenance Decisions and Support System (MDSS)	X	
Ramp Metering		
Signage Improvements		
Traffic Operations Center		
Traffic Signal Timing Adjustments	X	
Transit Signal Priority		
Variable Speed Limits		
Tier 5: Traffic Incident Management		
Courtesy Patrol		
Traffic Incident Management Plan		
Tier 6: Road Capacity		
Auxiliary Lanes	X	
Climbing Lanes		
Grade-Separated Crossings/Intersections		
New Lanes/Roads		
Roundabouts		
Toll/Express Lanes		

Opportunities:

- Consider implementing Truck Parking Information Management System at Johnson's corner
- Complete and maintain infrastructure consistent with RNMCs 1, 2, 7, 8, and 9
- Implement regional transit service consistent with RTCs 6 and 9

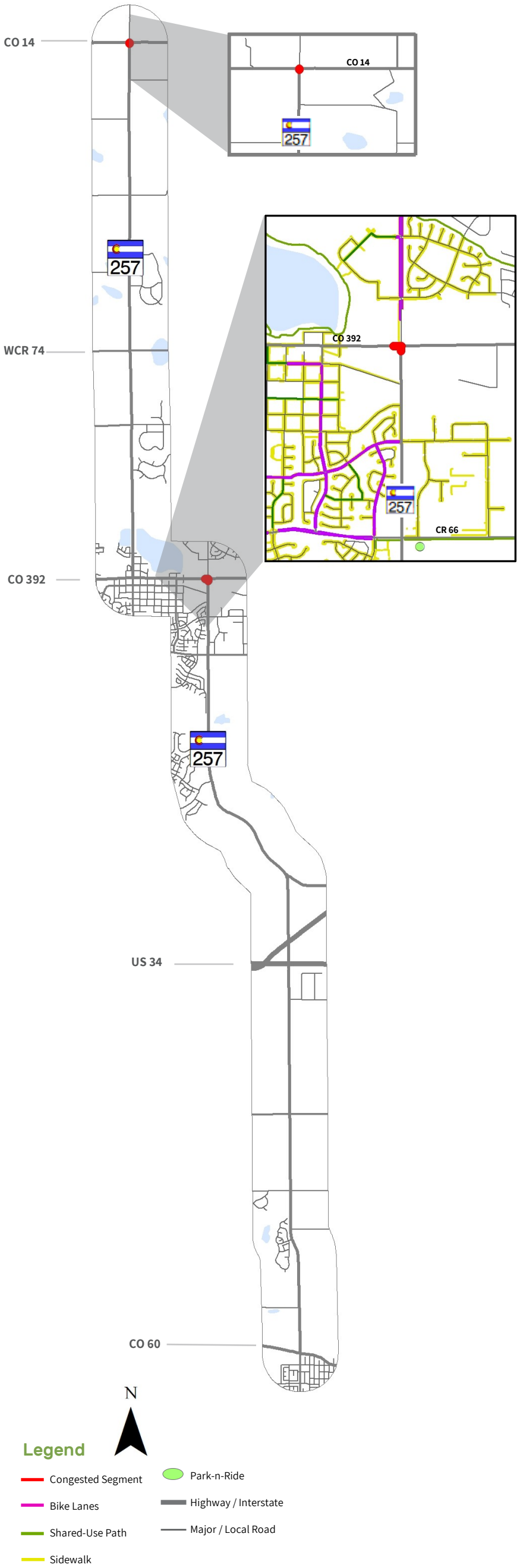
Parties Responsible:

- CDOT
- Larimer County
- Weld County
- Loveland
- Johnstown
- Milliken



RSC # 11: SH257 Corridor Profile

The vision for RSC #11 is to maintain system quality as well as to increase mobility and improve safety as passenger traffic volumes are expected to remain relatively constant, while freight volume will increase. Communities in the area will continue to depend on manufacturing, agriculture, and residential development for economic activity in the area. TDM improvements along this corridor are important, especially through Windsor. Portions of the surrounding area are transitioning from rural and agricultural to suburban.



Metric	2018	2030	2045
Percent of corridor with a TTI >= 1.5	0.1%	36.0%	47.7%
Population living within ¼ mile	4,580	6,677	12,824
Jobs located within ¼ mile	2,766	4,432	5,457

Source: NFRMPO 2015 Regional Travel Demand Model (RTDM), NFRMPO 2010 Land Use Allocation Model, INRIX

	Imp	Plan
Tier 1: Reducing Trip Generation and Shortening Trips		
Efficient Land Use and Development Practices		X
Tier 2: Encouraging Shift to Alternative Modes of Transportation		
Bike Infrastructure	X	X
Bike Share Service		
Bus Rapid Transit		
Car Sharing		
Complete Streets Policies		
Mobility Hubs		
Parking Pricing or Parking Restrictions		
Pedestrian Infrastructure	X	X
Transit Incentives		
Transit Service Quality Factors		
Transit Service Quantity Factors		X
Tier 3: Increasing Vehicle Occupancy and Shifting Travel Times		
Congestion Pricing		
High Occupancy Vehicle (HOV) Lanes		
Tier 4: Improving Roadway Operations without Expansion		
Access Management	X	
Advanced Traveler Information System		
Automatic Road Enforcement		
Dynamic Parking Management	X	
Electronic Toll Collection		
Fiber-Optic Communications		
Maintenance Decisions and Support System (MDSS)	X	
Ramp Metering		
Signage Improvements		
Traffic Operations Center		
Traffic Signal Timing Adjustments	X	
Transit Signal Priority		
Variable Speed Limits		
Tier 5: Traffic Incident Management		
Courtesy Patrol		
Traffic Incident Management Plan		
Tier 6: Road Capacity		
Auxiliary Lanes	X	
Climbing Lanes		
Grade-Separated Crossings/Intersections	X	
New Lanes/Roads		
Roundabouts	X	
Toll/Express Lanes		

Opportunities:

- Implement strategies from the Windsor Area Network Study
- Consider adopting a Complete Streets policy
- Complete and maintain infrastructure consistent with RNMCs 2, 3, 4, 6, and 11
- Implement regional transit service consistent with RTCs 1, 3, 4, 8, 10, and 12

Parties Responsible:

- CDOT
- Weld County
- Severance
- Windsor
- Greeley
- Milliken

RSC #12: SH392 Corridor

The vision for RSC #12 is to increase mobility and maintain system quality and improve safety as both passenger and freight traffic volumes are expected to continue to increase. Users of this RSC support the movement of commuters, freight, and farm-to-market products in and through the RSC, while recognizing environmental (including preservation and minimization/mitigation of impacts to protected public open lands/natural areas), economic, and social needs. TDM improvements along this corridor provide benefits to commuters. This RSC is Main Street through Windsor, also traversing suburban, urban, and rural agricultural areas.

Metric	2018	2030	2045
Percent of corridor with a TTI >= 1.5	7.3%	38.2%	69.3%
Population living within ¼ mile	4,920	7,276	12,744
Jobs located within ¼ mile	3,819	6,011	7,357

Source: NFRMPO 2015 Regional Travel Demand Model (RTDM), NFRMPO 2010 Land Use Allocation Model, INRIX, Bluetoad

	Imp	Plan
Tier 1: Reducing Trip Generation and Shortening Trips		
Efficient Land Use and Development Practices		
Tier 2: Encouraging Shift to Alternative Modes of Transportation		
Bike Infrastructure	X	X
Bike Share Service		
Bus Rapid Transit		
Car Sharing		
Complete Streets Policies		
Mobility Hubs		
Parking Pricing or Parking Restrictions		
Pedestrian Infrastructure	X	
Transit Incentives		
Transit Service Quality Factors		X
Transit Service Quantity Factors		X
Tier 3: Increasing Vehicle Occupancy and Shifting Travel Times		
Congestion Pricing		
High Occupancy Vehicle (HOV) Lanes		

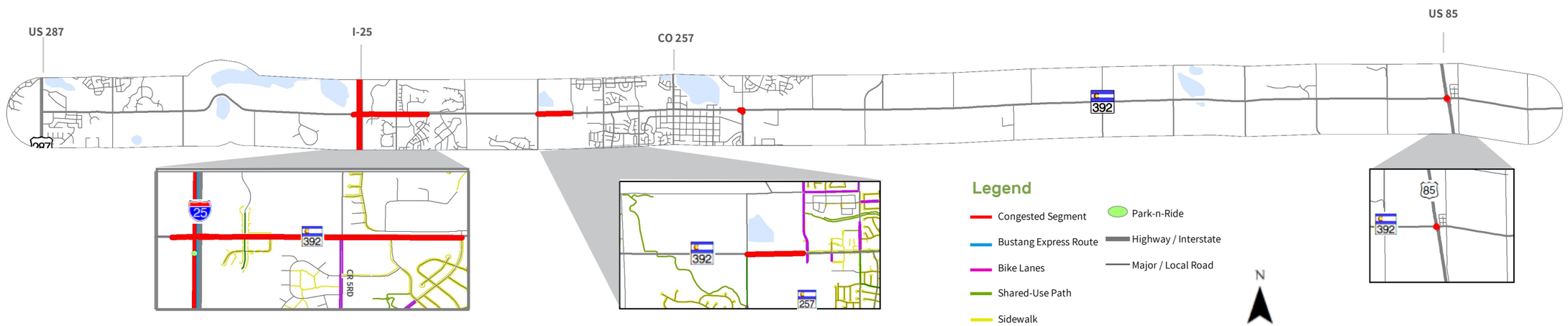
	Imp	Plan
Tier 4: Improving Roadway Operations without Expansion		
Access Management	X	
Advanced Traveler Information System		
Automatic Road Enforcement		
Dynamic Parking Management		
Electronic Toll Collection		
Fiber-Optic Communications		
Maintenance Decisions and Support System (MDSS)	X	
Ramp Metering		
Signage Improvements	X	
Traffic Operations Center		
Traffic Signal Timing Adjustments	X	
Transit Signal Priority		
Variable Speed Limits		
Tier 5: Traffic Incident Management		
Courtesy Patrol		
Traffic Incident Management Plan		
Tier 6: Road Capacity		
Auxiliary Lanes	X	
Climbing Lanes		
Grade-Separated Crossings/Intersections	X	
New Lanes/Roads		X
Roundabouts		
Toll/Express Lanes		

Opportunities:

- Implement strategies from the Windsor Area Network Study
- Consider adopting a Complete Streets policy
- Complete and maintain infrastructure consistent with RNMCs 4, 5, 6, 7, and 9
- Implement regional transit service consistent with RTCs 3, 6, 8, 9, 11, and 12

Parties Responsible:

- CDOT
- Larimer County
- Weld County
- Fort Collins
- Severance
- Windsor
- Greeley



RSC #13: SH402 / Freedom Parkway Corridor Profile

The vision for RSC #13 is to increase mobility, maintain system quality, and improve safety as traffic increases significantly, making the corridor a major west-east connection for the southern half of the region. Future travel modes to be planned for include passenger vehicle, bus service, and bicycle and pedestrian facilities. Communities along the corridor value high levels of mobility, transportation choices, and connections to other areas, safety, and system preservation. This corridor provides commuter access and makes west-east connections between Loveland, Johnstown, Greeley, and Evans. The road is planned for expansion to a four-lane facility according to Evans, Greeley, and Loveland Transportation Plans, and the SH402 Environmental Assessment.

Metric	2018	2030	2045
Percent of corridor with a TTI >= 1.5			
Population living within ¼ mile	10,812	12,368	16,656
Jobs located within ¼ mile	4,130	4,869	7,076

Source: NFRMPO 2015 Regional Travel Demand Model (RTDM), NFRMPO 2010 Land Use Allocation Model, INRIX

	Imp	Plan
Tier 1: Reducing Trip Generation and Shortening Trips		
Efficient Land Use and Development Practices	X	X
Tier 2: Encouraging Shift to Alternative Modes of Transportation		
Bike Infrastructure	X	X
Bike Share Service		
Bus Rapid Transit		
Car Sharing		
Complete Streets Policies		X
Mobility Hubs		X
Parking Pricing or Parking Restrictions		
Pedestrian Infrastructure	X	X
Transit Incentives	X	
Transit Service Quality Factors	X	
Transit Service Quantity Factors	X	
Tier 3: Increasing Vehicle Occupancy and Shifting Travel Times		
Congestion Pricing		
High Occupancy Vehicle (HOV) Lanes		

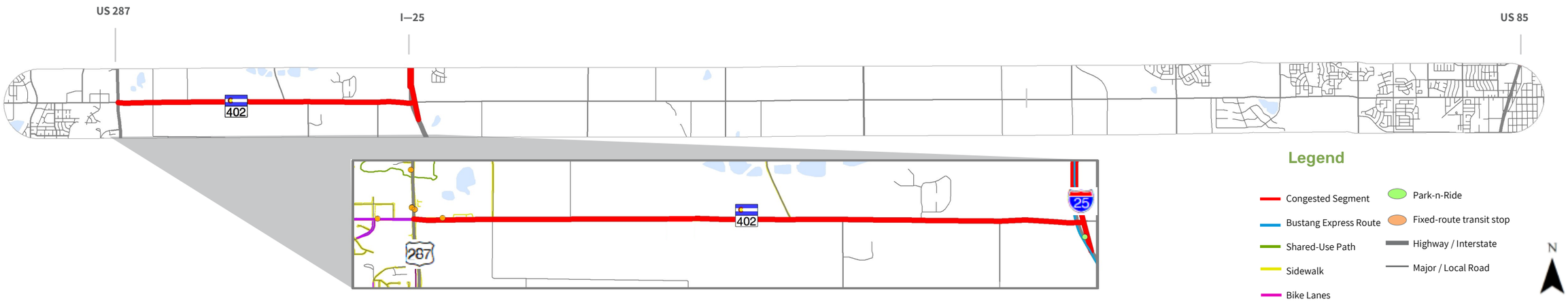
	Imp	Plan
Tier 4: Improving Roadway Operations without Expansion		
Access Management	X	X
Advanced Traveler Information System	X	
Automatic Road Enforcement		
Dynamic Parking Management		
Electronic Toll Collection		
Fiber-Optic Communications		X
Maintenance Decisions and Support System (MDSS)	X	
Ramp Metering		
Signage Improvements		
Traffic Operations Center		
Traffic Signal Timing Adjustments		
Transit Signal Priority		
Variable Speed Limits		
Tier 5: Traffic Incident Management		
Courtesy Patrol		
Traffic Incident Management Plan		
Tier 6: Road Capacity		
Auxiliary Lanes	X	X
Climbing Lanes		
Grade-Separated Crossings/Intersections		
New Lanes/Roads		X
Roundabouts		X
Toll/Express Lanes		

Opportunities:

- Implement access recommendations from the Freedom Parkway Access Control Plan
- Complete and maintain infrastructure consistent with RNMCs 3, 8, 9, and 10
- Implement regional transit service consistent with RTC 9

Parties Responsible:

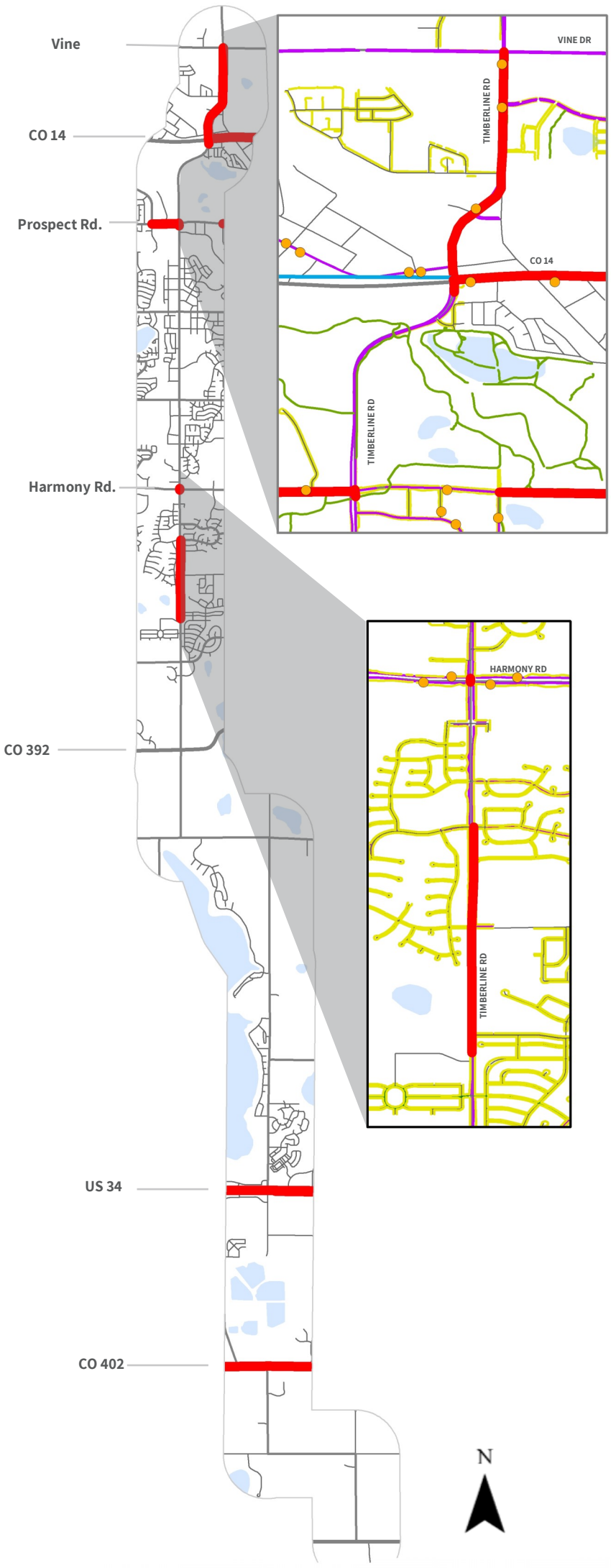
- CDOT
- Larimer County
- Weld County
- Loveland
- Johnstown
- Greeley
- Evans



RSC # 16: LCR 7 / LCR 9 / Timberline Road Profile

The vision for RSC #16 is to increase mobility, improve safety, and maintain system quality as both passenger and freight traffic volumes increase. The communities along the RSC also value transportation choices, connections to other areas, and intermodal connections. The surrounding area will continue to depend on manufacturing, high-tech industries, commercial activity, retail, and residential development for economic activity. Upon completion, the RSC will support the regional movement of commuters.

This RSC provides access to the Northern Colorado Regional Airport (FNL), Centerra, and areas transitioning from rural to suburban. Individually, Timberline Road, LCR 9E, and WCR 7 serve as parallel local arterials west of N I-25 (RSC #1). Realignment is planned for the section between Fort Collins and Loveland.



Metric	2018	2030	2045
Percent of corridor with a TTI >= 1.5	9.3%	28.8%	46.4%
Population living within ¼ mile	15,374	20,344	24,164
Jobs located within ¼ mile	11,299	13,624	19,606

Source: NFRMPO 2015 Regional Travel Demand Model (RTDM), NFRMPO 2010 Land Use Allocation Model, INRIX, NPMRDS

	Imp	Plan
Tier 1: Reducing Trip Generation and Shortening Trips		
Efficient Land Use and Development Practices	X	X
Tier 2: Encouraging Shift to Alternative Modes of Transportation		
Bike Infrastructure	X	X
Bike Share Service		X
Bus Rapid Transit		
Car Sharing		
Complete Streets Policies	X	
Mobility Hubs		
Parking Pricing or Parking Restrictions		
Pedestrian Infrastructure		
Transit Incentives		X
Transit Service Quality Factors		X
Transit Service Quantity Factors		X
Tier 3: Increasing Vehicle Occupancy and Shifting Travel Times		
Congestion Pricing		
High Occupancy Vehicle (HOV) Lanes		
Tier 4: Improving Roadway Operations without Expansion		
Access Management		
Advanced Traveler Information System		
Automatic Road Enforcement	X	
Dynamic Parking Management		
Electronic Toll Collection		
Fiber-Optic Communications	X	
Maintenance Decisions and Support System (MDSS)	X	
Ramp Metering		
Signage Improvements	X	
Traffic Operations Center	X	
Traffic Signal Timing Adjustments		
Transit Signal Priority		
Variable Speed Limits		
Tier 5: Traffic Incident Management		
Courtesy Patrol	X	
Traffic Incident Management Plan	X	
Tier 6: Road Capacity		
Auxiliary Lanes	X	
Climbing Lanes		
Grade-Separated Crossings/Intersections	X	
New Lanes/Roads	X	X
Roundabouts	X	
Toll/Express Lanes		

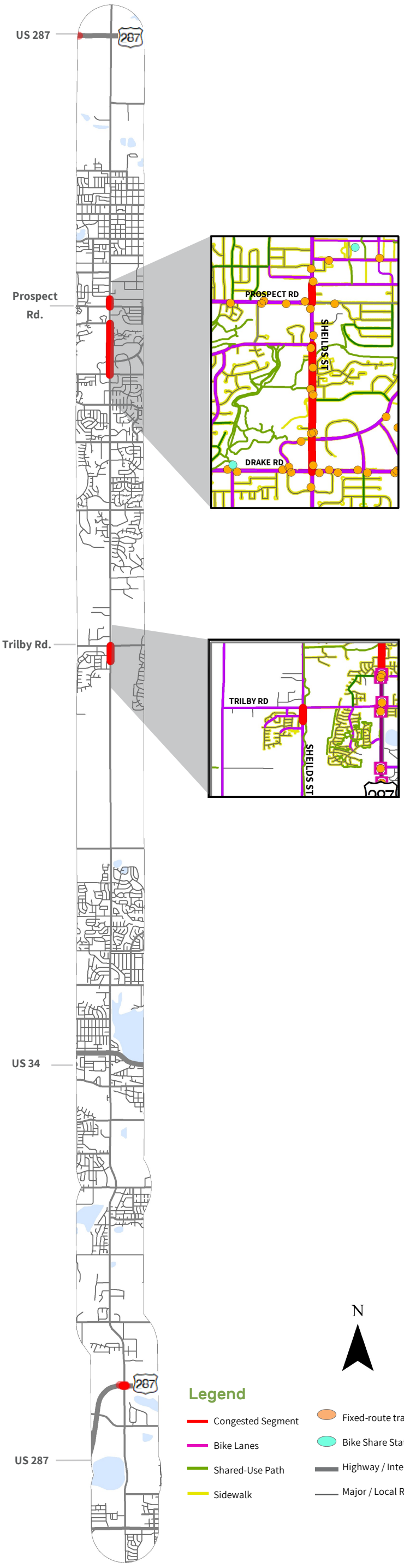
Opportunities:

- Implement high frequency transit in Fort Collins
- Develop Mobility Hubs near Harmony and Vine
- Complete pedestrian infrastructure between Fort Collins and Loveland
- Complete and maintain infrastructure consistent with RNMCs 3, 4, 5, 6, and 7
- Implement regional transit service consistent with RTCs 1, 4, 6, 10, and 12

Parties Responsible:

- Larimer County
- Fort Collins
- Loveland
- Berthoud

RSC # 17: LCR17 / Shields / Taft Corridor Profile



Future travel modes to be planned for RSC #17 include passenger vehicle, bus service, and bicycle and pedestrian facilities. As passenger volumes increase significantly, and freight traffic volumes remain relatively constant, communities along the RSC will continue to depend on commercial activity, residential development, Colorado State University (CSU), governmental agencies, as well as manufacturing and high-tech industries for economic activity. Users of this RSC want to retain the character of the area, including the dedicated open space between Fort Collins and Loveland, while supporting the movement of commuters and freight along the RSC and recognizing the environmental, economic, and social needs of the surrounding area. Transit service and TDM consideration are important along this RSC.

Metric	2018	2030	2045
Percent of corridor with a TTI >= 1.5	4.3%	7.0%	24.2%
Population living within ¼ mile	33,727	35,371	37,581
Jobs located within ¼ mile	8,577	9,261	11,458

Source: NFRMPO 2015 Regional Travel Demand Model (RTDM), NFRMPO 2010 Land Use Allocation Model, INRIX, Acyclica

	Imp	Plan
Tier 1: Reducing Trip Generation and Shortening Trips		
Efficient Land Use and Development Practices	X	
Tier 2: Encouraging Shift to Alternative Modes of Transportation		
Bike Infrastructure	X	X
Bike Share Service	X	
Bus Rapid Transit		
Car Sharing	X	
Complete Streets Policies	X	
Mobility Hubs	X	
Parking Pricing or Parking Restrictions	X	
Pedestrian Infrastructure	X	
Transit Incentives	X	
Transit Service Quality Factors	X	
Transit Service Quantity Factors	X	X
Tier 3: Increasing Vehicle Occupancy and Shifting Travel Times		
Congestion Pricing		
High Occupancy Vehicle (HOV) Lanes		
Tier 4: Improving Roadway Operations without Expansion		
Access Management		
Advanced Traveler Information System	X	
Automatic Road Enforcement		
Dynamic Parking Management	X	
Electronic Toll Collection		
Fiber-Optic Communications	X	
Maintenance Decisions and Support System (MDSS)		
Ramp Metering		
Signage Improvements	X	
Traffic Operations Center	X	
Traffic Signal Timing Adjustments	X	
Transit Signal Priority	X	
Variable Speed Limits		
Tier 5: Traffic Incident Management		
Courtesy Patrol		
Traffic Incident Management Plan		
Tier 6: Road Capacity		
Auxiliary Lanes	X	
Climbing Lanes		
Grade-Separated Crossings/Intersections	X	
New Lanes/Roads	X	X
Roundabouts	X	
Toll/Express Lanes		

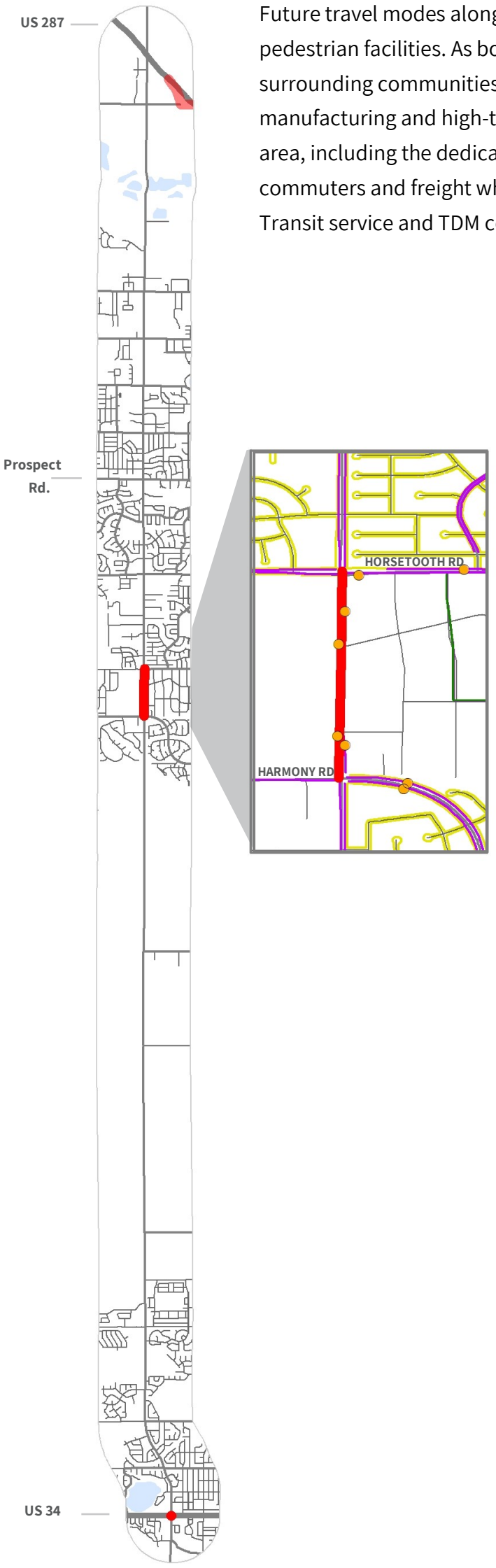
Opportunities:

- Consider adopting a Complete Streets policy
- Complete and maintain infrastructure consistent with RNMCs 5, 6, 7, 8, and 11
- Implement regional transit service consistent with RTCs 9 and 10

Parties Responsible:

- Larimer County
- Fort Collins
- Loveland
- Berthoud

RSC # 18: LCR19 / Taft Hill Road / Wilson Avenue Corridor Profile



Future travel modes along RSC #18 will include passenger vehicle, bus service, truck freight, and bicycle and pedestrian facilities. As both passenger and freight traffic volumes are expected to increase significantly, the surrounding communities will continue to depend on commercial activity, residential development, as well as manufacturing and high-tech industries for economic activity. Users of this RSC want to retain the character of the area, including the dedicated open space between Fort Collins and Loveland, while supporting the movement of commuters and freight while recognizing the environmental, economic, and social needs of the surrounding area. Transit service and TDM consideration are important along this RSC.

Metric	2018	2030	2045
Percent of corridor with a TTI >= 1.5	3.2%	1.5%	6.5%
Population living within ¼ mile	16,452	15,365	16,233
Jobs located within ¼ mile	4,516	4,661	5,506

Source: NFRMPO 2015 Regional Travel Demand Model (RTDM), NFRMPO 2010 Land Use Allocation Model, INRIX

	Imp	Plan
Tier 1: Reducing Trip Generation and Shortening Trips		
Efficient Land Use and Development Practices	X	
Tier 2: Encouraging Shift to Alternative Modes of Transportation		
Bike Infrastructure	X	
Bike Share Service	X	
Bus Rapid Transit		
Car Sharing	X	
Complete Streets Policies	X	
Mobility Hubs		
Parking Pricing or Parking Restrictions		
Pedestrian Infrastructure	X	
Transit Incentives	X	
Transit Service Quality Factors	X	
Transit Service Quantity Factors	X	X
Tier 3: Increasing Vehicle Occupancy and Shifting Travel Times		
Congestion Pricing		
High Occupancy Vehicle (HOV) Lanes		
Tier 4: Improving Roadway Operations without Expansion		
Access Management		
Advanced Traveler Information System	X	
Automatic Road Enforcement		
Dynamic Parking Management	X	
Electronic Toll Collection		
Fiber-Optic Communications	X	
Maintenance Decisions and Support System (MDSS)		
Ramp Metering		
Signage Improvements	X	
Traffic Operations Center	X	
Traffic Signal Timing Adjustments	X	
Transit Signal Priority	X	
Variable Speed Limits		
Tier 5: Traffic Incident Management		
Courtesy Patrol		
Traffic Incident Management Plan		
Tier 6: Road Capacity		
Auxiliary Lanes	X	
Climbing Lanes		
Grade-Separated Crossings/Intersections	X	
New Lanes/Roads	X	X
Roundabouts	X	
Toll/Express Lanes		

Opportunities:

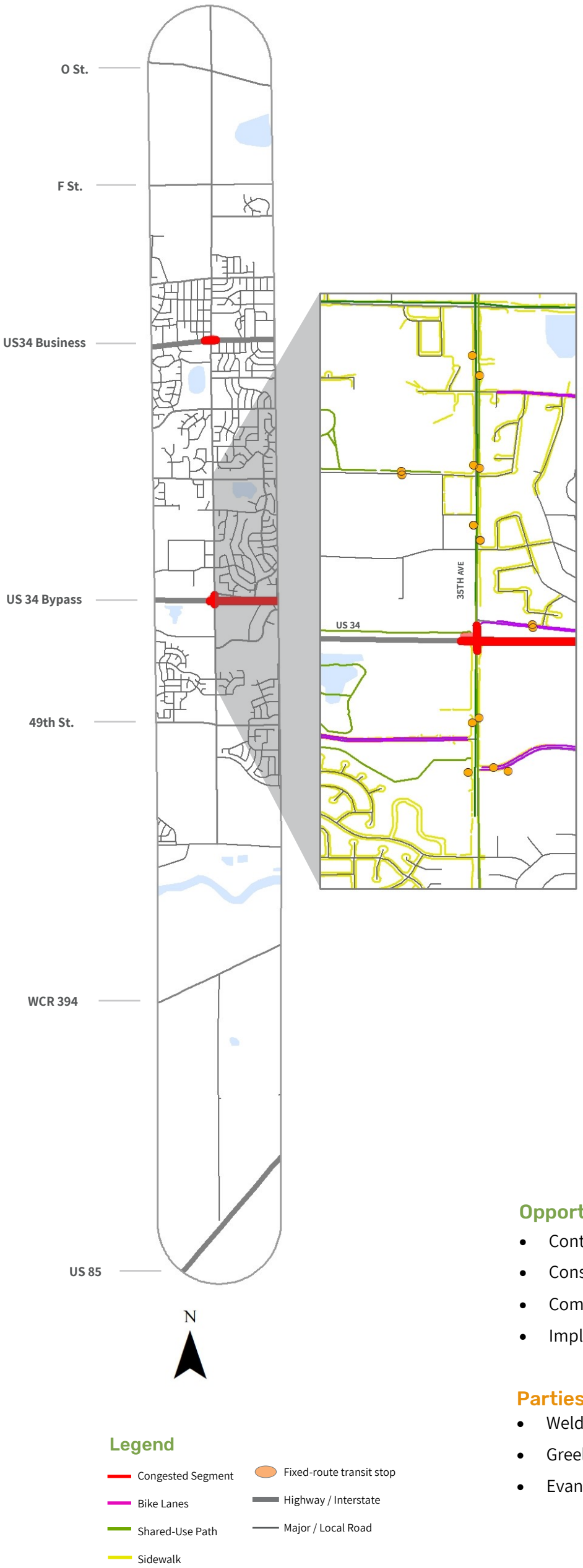
- Consider adopting a Complete Streets policy
- Complete and maintain infrastructure consistent with RNMCs 5, 6, and 11
- Implement regional transit service consistent with RTC 10

Parties Responsible:

- Larimer County
- Fort Collins
- Loveland

RSC # 22: WCR 35 / 35th Avenue

The vision for RSC #22 is to increase mobility. Future travel modes are planned to include passenger vehicle and truck freight, TDM, and bike lanes which could be effective along this RSC. Passenger traffic volumes are expected to increase around the intersection with RSC #2. Users of RSC #22 support the movement of commuters in and through the RSC, while recognizing the environmental, economic, and social needs of the surrounding area. Upon completion, the RSC will improve Greeley's and Evans' access to southbound US85 (RSC #4). Transit service is important along this corridor and there are plans for bicycle and pedestrian improvements.



Metric	2018	2030	2045
Percent of corridor with a TTI >= 1.5	0.0%	0.0%	10.7%
Population living within ¼ mile	9,985	10,175	10,539
Jobs located within ¼ mile	3,713	3,890	4,596

Source: NFRMPO 2015 Regional Travel Demand Model (RTDM), NFRMPO 2010 Land Use Allocation Model, INRIX, NPMRDS

	Imp	Plan
Tier 1: Reducing Trip Generation and Shortening Trips		
Efficient Land Use and Development Practices	X	
Tier 2: Encouraging Shift to Alternative Modes of Transportation		
Bike Infrastructure	X	X
Bike Share Service		
Bus Rapid Transit		
Car Sharing		
Complete Streets Policies		
Mobility Hubs		
Parking Pricing or Parking Restrictions		
Pedestrian Infrastructure	X	
Transit Incentives	X	
Transit Service Quality Factors	X	
Transit Service Quantity Factors	X	
Tier 3: Increasing Vehicle Occupancy and Shifting Travel Times		
Congestion Pricing		
High Occupancy Vehicle (HOV) Lanes		
Tier 4: Improving Roadway Operations without Expansion		
Access Management		
Advanced Traveler Information System		
Automatic Road Enforcement		
Dynamic Parking Management		
Electronic Toll Collection		
Fiber-Optic Communications		
Maintenance Decisions and Support System (MDSS)		
Ramp Metering		
Signage Improvements		
Traffic Operations Center	X	
Traffic Signal Timing Adjustments	X	
Transit Signal Priority		
Variable Speed Limits		
Tier 5: Traffic Incident Management		
Courtesy Patrol		
Traffic Incident Management Plan		
Tier 6: Road Capacity		
Auxiliary Lanes	X	
Climbing Lanes		
Grade-Separated Crossings/Intersections		
New Lanes/Roads		X
Roundabouts		X
Toll/Express Lanes		

Opportunities:

- Continue to improve operations through signal timing adjustments
- Consider grade separations and interchanges
- Complete and maintain infrastructure consistent with RNMCs 1, 6, and 11
- Implement regional transit service consistent with RTCs 3, 8, and 10

Parties Responsible:

- Weld County
- Greeley
- Evans

RSC #23: WCR74 / Harmony Road Corridor

The vision for RSC #23 is to increase mobility as well as to maintain system quality and improve safety as both passenger and freight traffic volumes increase. Future travel modes to be planned for include passenger vehicle, bus service, freight trucks, and bicycle and pedestrian facilities. Users of this RSC support the movement of commuters, freight, and farm-to-market products in and along the RSC, while recognizing the environmental (including preservation and minimization/mitigation of impacts to protected public open lands/ natural areas), economic, and social needs of the surrounding area.

This RSC serves as a local facility, provides commuter access, and an west-east connection between south Fort Collins, Timnath, Windsor, Severance, and Eaton. The area adjacent to the western portion of the RSC is urban, while the areas in the central and eastern portions of the RSC are transitioning from agricultural to suburban. The western portion of the RSC is an important link in the Transfort and Bustang transit systems.

Metric	2018	2030	2045
Percent of corridor with a TTI >= 1.5	8.6%	27.1%	53.4%
Population living within ¼ mile	13,546	27,541	33,203
Jobs located within ¼ mile	15,032	16,181	18,177

Source: NFRMPO 2015 Regional Travel Demand Model (RTDM), NFRMPO 2010 Land Use Allocation Model, INRIX, NPMRDS

	Imp	Plan
Tier 1: Reducing Trip Generation and Shortening Trips		
Efficient Land Use and Development Practices		X
Tier 2: Encouraging Shift to Alternative Modes of Transportation		
Bike Infrastructure	X	X
Bike Share Service	X	
Bus Rapid Transit		X
Car Sharing		
Complete Streets Policies	X	
Mobility Hubs	X	
Parking Pricing or Parking Restrictions		
Pedestrian Infrastructure	X	
Transit Incentives	X	
Transit Service Quality Factors	X	X
Transit Service Quantity Factors	X	X

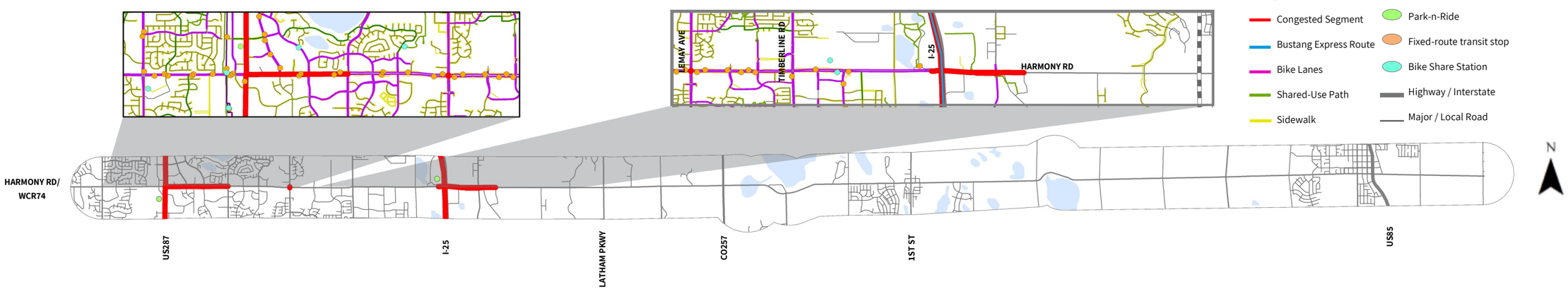
	Imp	Plan
Tier 3: Increasing Vehicle Occupancy and Shifting Travel Times		
Congestion Pricing		
High Occupancy Vehicle (HOV) Lanes		
Tier 4: Improving Roadway Operations without Expansion		
Access Management	X	
Advanced Traveler Information System		
Automatic Road Enforcement		
Dynamic Parking Management		
Electronic Toll Collection		
Fiber-Optic Communications	X	
Maintenance Decisions and Support System (MDSS)		
Ramp Metering		
Signage Improvements	X	
Traffic Operations Center	X	
Traffic Signal Timing Adjustments	X	
Transit Signal Priority		X
Variable Speed Limits		
Tier 5: Traffic Incident Management		
Courtesy Patrol		
Traffic Incident Management Plan		
Tier 6: Road Capacity		
Auxiliary Lanes	X	
Climbing Lanes		
Grade-Separated Crossings/Intersections	X	X
New Lanes/Roads	X	X
Roundabouts		X
Toll/Express Lanes		

Opportunities:

- Implement BRT
- Continue to improve operations through signal timing adjustments
- Consider grade separation
- Complete and maintain infrastructure consistent with RNMCs 4, 6, 7, 8, and 9
- Implement regional transit service consistent with RTCs 1, 3, 6, 9, and 11

Parties Responsible:

- Larimer County
- Weld County
- Fort Collins
- Timnath
- Windsor
- Severance
- Eaton



RSC #28: Prospect Road Corridor

The vision for RSC #28 is to increase mobility as well as to improve safety and maintain system quality as passenger traffic volumes increase and freight volumes remain relatively constant. The communities along this RSC also value transportation choices, and connections to other areas. Future travel modes to be planned for include passenger vehicles, bus service, and bicycles and pedestrians. Users of this RSC want to preserve the character of the area including the wetlands surrounding the Poudre River. Users also support the movement of commuters while recognizing the environmental, economic, and social needs of the surrounding area.

This RSC serves as an important regional link between central Fort Collins, Timnath, and N I-25 (RSC #1) and provides another access point to CSU, several natural areas, the Prospect Rest Area and the Colorado Welcome Center west of N I-25. This RSC is an important route for the Transfort system.

Metric	2018	2030	2045
Percent of corridor with a TTI >= 1.5	40.6%	45.9%	88.4%
Population living within ¼ mile	4,855	6,155	9,356
Jobs located within ¼ mile	8,163	7,851	8,362

Source: NFRMPO 2015 Regional Travel Demand Model (RTDM), NFRMPO 2010 Land Use Allocation Model, INRIX, NPMRDS

	Imp	Plan
Tier 1: Reducing Trip Generation and Shortening Trips		
Efficient Land Use and Development Practices	X	X
Tier 2: Encouraging Shift to Alternative Modes of Transportation		
Bike Infrastructure	X	X
Bike Share Service	X	
Bus Rapid Transit		
Car Sharing		
Complete Streets Policies	X	
Mobility Hubs		
Parking Pricing or Parking Restrictions		
Pedestrian Infrastructure	X	
Transit Incentives	X	
Transit Service Quality Factors	X	
Transit Service Quantity Factors	X	X

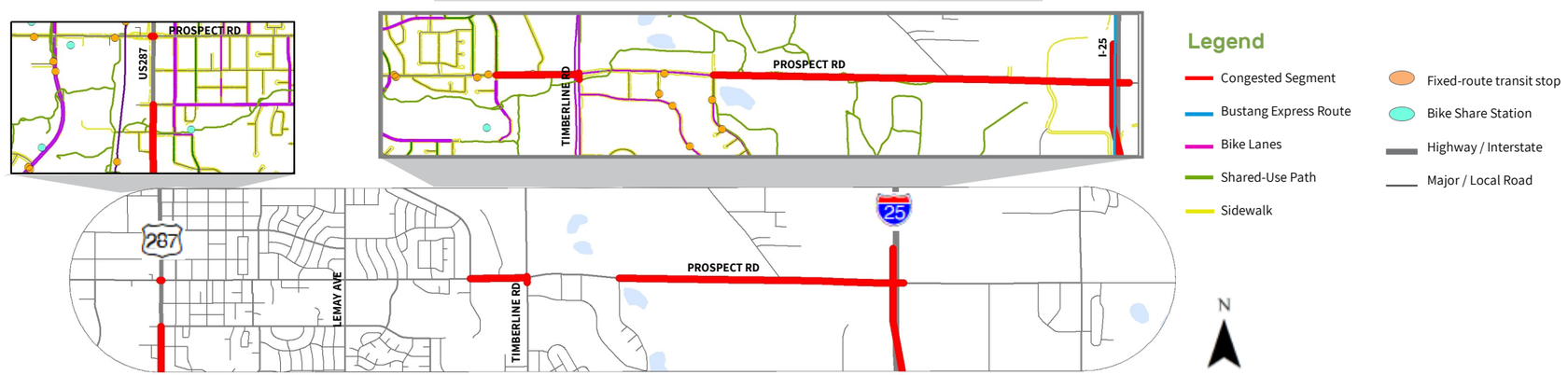
	Imp	Plan
Tier 3: Increasing Vehicle Occupancy and Shifting Travel Times		
Congestion Pricing		
High Occupancy Vehicle (HOV) Lanes		
Tier 4: Improving Roadway Operations without Expansion		
Access Management	X	
Advanced Traveler Information System		
Automatic Road Enforcement		
Dynamic Parking Management		
Electronic Toll Collection		
Fiber-Optic Communications	X	
Maintenance Decisions and Support System (MDSS)		
Ramp Metering		
Signage Improvements	X	
Traffic Operations Center		
Traffic Signal Timing Adjustments	X	
Transit Signal Priority		
Variable Speed Limits		
Tier 5: Traffic Incident Management		
Courtesy Patrol		
Traffic Incident Management Plan		
Tier 6: Road Capacity		
Auxiliary Lanes	X	
Climbing Lanes		
Grade-Separated Crossings/Intersections	X	
New Lanes/Roads		X
Roundabouts		
Toll/Express Lanes		

Opportunities:

- Study grade separation
- Plan roadway operations for development along corridor
- Complete and maintain infrastructure consistent with RNMCs 6 and 7
- Implement regional transit service consistent with RTCs 3, 6, and 9

Parties Responsible:

- Fort Collins
- Timnath



Implementing the 2019 CMP

Effectively managing and even mitigating congestion in the North Front Range will require a multi-level, multi-jurisdictional approach. Though the recommendations highlighted in the Congested Corridor profiles fall generally to the parties identified as responsible for each Corridor, the NFRMPO must still play an active role in ensuring the 2019 CMP is incorporated into the region's long-range planning and short-term programming. Additionally, some strategies fall outside of the purview of the NFRMPO and the NFRMPO's planning partners. For instance, efficient land use and development planning were not included as part of corridor recommendations; however, effective congestion mitigation should not exclude these Tier 1 Strategies. Finally, many strategies fall to private organizations, including telecommuting policies and the provision of incentives for using alternative transportation modes. The Action Plan that follows enumerates recommended action steps for ensuring the 2019 CMP is implemented to the fullest extent practicable, providing the greatest possibility for an efficient and effective transportation network for the region now and into the future.

Recommendations

NFRMPO Responsibilities

- Standardize reporting process for general-purpose projects to be included in the TIP to ensure all relevant TDM and Operational Improvements were considered prior to the general-purpose project.
- Modify scoring criteria for the Call for Projects to reflect the Strategy Tiers and/or the Corridor recommendations.
- Encourage NFRMPO planning partners to use evaluation tools to better understand the costs and benefits of expanding or creating new TDM programs.
- Track progress of the 2019 CMP by reporting on metrics outlined in **Chapter 3** in the period CMP performance report**.**
- Conduct education and outreach during community events to encourage residents to consider implementing congestion-mitigating strategies in their daily life.
- Partner with Regional Air Quality Council (RAQC) through their Simple Steps. Better Air campaign to leverage educational materials.

NFRMPO Planning Partners Responsibilities

- Identify local funding sources and additional grant opportunities to fund strategies identified for their jurisdiction.
- Work with community partners to identify opportunities for more efficient land use planning and development.
- Coordinate with private entities within their jurisdiction to encourage the implementation of organization- or development-specific strategies.
- Explore tools designed to measure the costs and benefits of existing or planned TDM programs to develop data in support of expanding or creating new TDM programs.

Funding Opportunities

The NFRMPO administers three funding programs for which projects intended to implement the CMP may be eligible. The following provides a sample of strategies eligible for each grant program administered by the NFRMPO. It is important to note, while these may serve as a starting point for identifying funds, NFRMPO-administered funds are limited and are awarded according to scoring criteria that complies with federal requirements and is approved by the NFRMPO Planning Council. Parties responsible for implementing congestion-reducing strategies should also seek out external funding sources.

Surface Transportation Block Grant (STBG) Program

According to FHWA, the Surface Transportation Block Grant program (STBG) provides "flexible funding that may be used by States and localities for projects to preserve and improve the conditions and performance on any Federal-aid highway, bridge and tunnel projects on any public road, pedestrian and bicycle infrastructure, and transit capital projects, including intercity bus terminals."[14] Project types eligible for STBG funding include:

- Bicycle Infrastructure
- Pedestrian Infrastructure
- Transit Service Quality Factors
- Transit Service Quantity Factors
- High Occupancy Vehicle (HOV) Lanes
- Access Management
- Toll/Express Lanes
- Climbing Lanes
- Auxiliary Lanes
- Grade-Separated Crossing
- New Lanes/New Roads

Congestion Mitigation and Air Quality Improvement (CMAQ) Program

The CMAQ program provides "a flexible funding source to State and local governments for transportation projects and programs to help meet the requirements of the Clean Air Act. Funding is available to reduce congestion and improve air quality for areas that do not meet the National Ambient Air Quality Standards for ozone, carbon monoxide, or particulate matter (nonattainment areas) and for former nonattainment areas that are now in compliance (maintenance areas)."[15] Project types eligible for CMAQ funding include:

- Bicycle Infrastructure
- Pedestrian Infrastructure
- Transit Service Quality Factors
- Transit Service Quantity Factors
- High Occupancy Vehicle (HOV) Lanes
- Access Management
- Advanced Traveler Information System
- Fiber-Optic Communications
- Ramp Metering
- Traffic Signal Timing Adjustments

[14] Surface Transportation Block Grant Program (STBG), FHWA, https://www.fhwa.dot.gov/specialfunding/stp/, accessed 4/18/19.
[15] Congestion Mitigation and Air Quality Improvement Program Fact Sheet, FHWA, https://www.fhwa.dot.gov/fastact/factsheets/cmaqfs.cfm, accessed 4/18/19.

Transportation Alternatives (TA) Program

TA funds are a "set-aside of the Surface Transportation Block Grant (STBG) program funding. These set-aside funds include all projects and activities that were previously eligible under TAP, encompassing a variety of smaller-scale transportation projects such as pedestrian and bicycle facilities, recreational trails, and safe routes to school projects."[16] Project types eligible for TA funding include:

- Bicycle Infrastructure
- Pedestrian Infrastructure

[16] Transportation Alternatives Fact Sheet, FHWA, https://www.fhwa.dot.gov/fastact/factsheets/transportationalternativesfs.cfm, accessed 4/18/19.