NFR MPO Congestion Management Process

September 2010

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engineering paths to transportation solutions

NFR MPO Congestion Management Process

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I. INTRODUCTION

A. Background

Federal Requirements

Federal requirements state that regions with more than 200,000 people, known as Transportation Management Areas (TMAs), must maintain a Congestion Management Process (CMP) and use it to make informed transportation planning decisions. These requirements were introduced by the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 as a "Congestion Management System" and were continued under the successive transportation authorization laws, including the current law, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). SAFTEA-LU refers to a "Congestion Management *Process,*" reflecting the goal of the law to utilize a process that is an integral component of metropolitan transportation planning.

The Federal Highway Administration (FHWA) defines a CMP as a "systematic transparent process for managing congestion that provides information on transportation system performance and on alternative strategies for alleviating congestion and enhancing mobility." The purpose of the CMP is to define congested corridors in the region, develop strategies to mitigate the congestion, and provide a way to monitor the effectiveness of the strategies. The CMP is also intended to use performance measures to direct funding toward projects and strategies that are most effective for addressing congestion. The CMP is intended to augment and be folded into the overall metropolitan transportation planning process in the North Front Range.

FHWA requires that consideration be given first to strategies that reduce single occupancy vehicle (SOV) travel and improve the efficiency of the existing system. All other reasonable strategies must be analyzed before a capacity increase is proposed as a congestion management approach.

The FHWA regulations (23 CFR Part 450 Sec. 320) specify that an effective CMP should include:

- Methods to monitor and evaluate the performance of the multimodal transportation system, identify the causes of reoccurring and non-recurring congestion, identify and evaluate alternative strategies, provide information supporting the implementation of actions, and evaluate the efficiency and effectiveness of implemented actions;
- Definition of objectives and performance measures to assess the extent of congestion and support the evaluation of the effectiveness of congestion reduction and mobility enhancement strategies;
- Establishment of a program for data collection and system performance monitoring to define the extent and causes of congestion, to contribute in determining the causes of congestion, and to evaluate the efficiency and effectiveness of implemented actions;
- Identification and evaluation of the anticipated performance and benefits of both traditional and non-traditional congestion management strategies;
- Identification of an implementation schedule, implementation responsibilities, and possible funding sources for each strategy; and
- Implementation of a process for periodic assessment of the efficiency and effectiveness of implemented strategies, in terms of the area's established performance measures.

History of NFR MPO's CMP

The NFR MPO was designated a TMA in 2002 as a result of data from the 2000 U.S. Census. In 2004, FHWA accepted a Congestion Management Framework in lieu of a Congestion Management System, given the short time frame between the NFR MPO designation as a TMA and the publication of the 2030 Regional Transportation Plan (RTP).

In 2007, the framework was expanded into a full Congestion Management Process, which was integrated with the 2035 RTP. During the development of the 2035 RTP and CMP in 2007, the Technical Advisory Committee (TAC) and Planning Council identified Tier One of the Regionally Significant Corridors (RSCs) to be the focus of the Congestion Management Process in the North Front Range. Tier One corridors include I-25, US 34, US 287 and their parallel facilities. The 2007 CMP identifies the causes of congestion on the Tier One corridors as well as strategies to manage congestion.

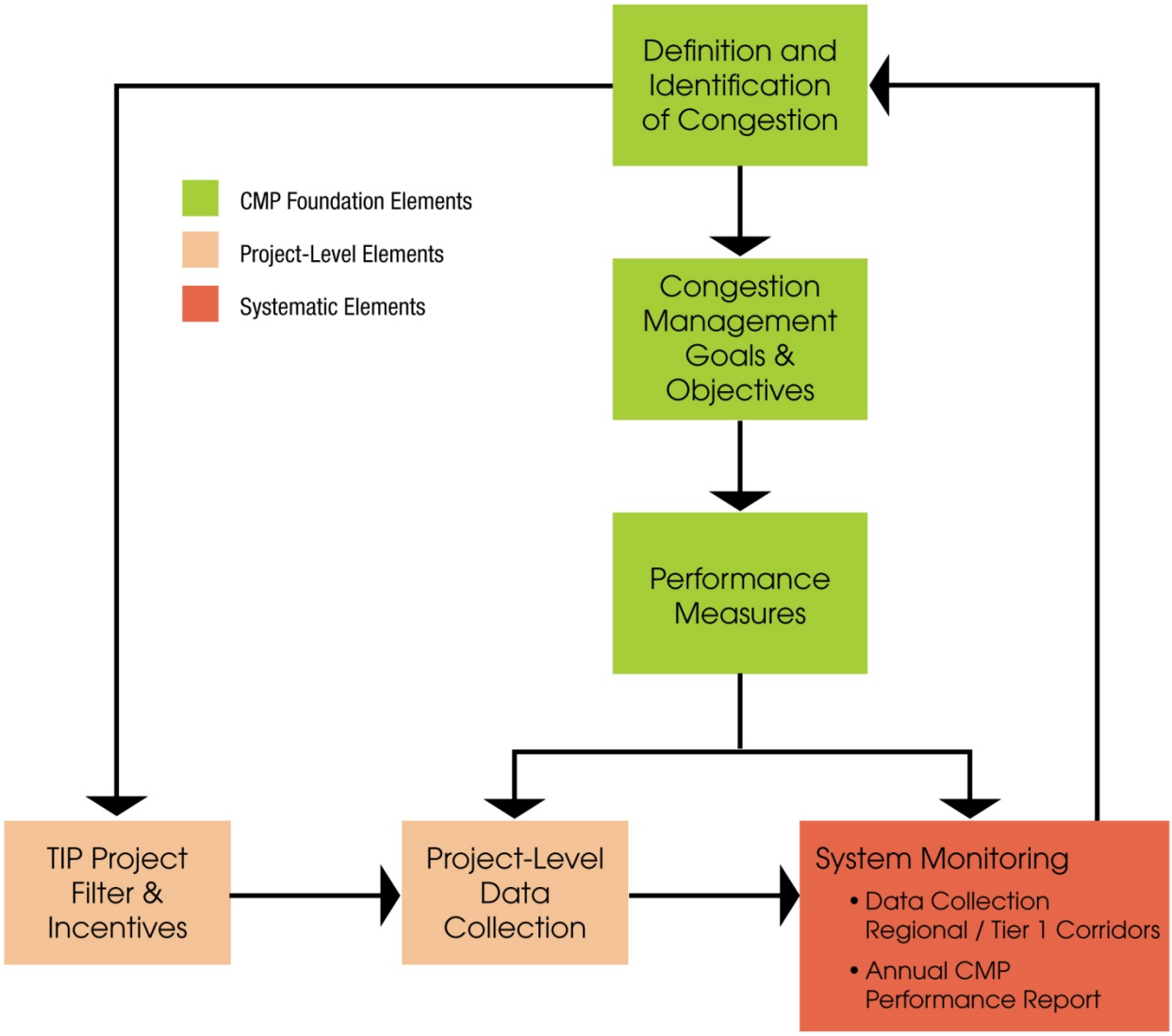
B. Purpose

The primary focus of this CMP update is to build upon the MPO's previous CMP by integrating real world data collection and performance measures into the process. Not only must the CMP meet the federal requirements, but the NFR MPO has a desire to use the CMP as a mechanism to provide regional benchmarking to inform transportation investment decisions and to paint a clear picture of the region's transportation needs. The completed CMP will be integrated into the 2035 RTP Update.

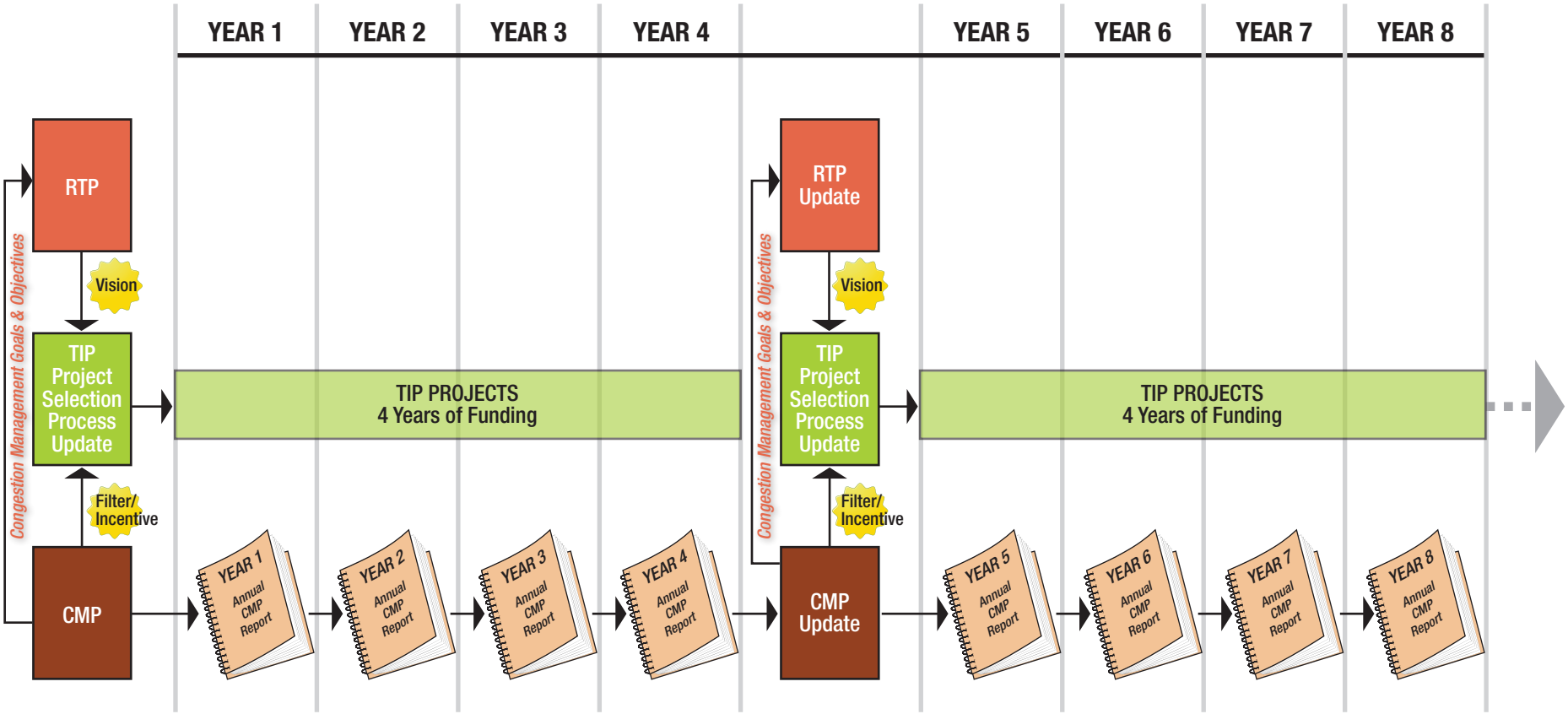
CMP Structure

The structure of the MPO's Congestion Management Process is depicted on **Figure 1**. The green boxes represent elements of the CMP that establish the state of the region's congestion and what is important to the region in terms of managing or mitigating the congestion. The beige boxes represent project-level components of the CMP; the CMP serves as both a filter and an incentive in selecting projects for the Transportation Improvement Program (TIP), and all projects that receive funding through the MPO are required to collect before and after data. Finally, the salmon colored box represents the systemic component of the CMP; regional and corridor-level data will be collected on an annual basis to compare the state of the region in terms of congestion levels on a year to year basis. Both the system monitoring and the project-level data collection will be documented and analyzed in the Annual CMP Performance Report. These basic elements of the process are to operate as a cycle to continually adjust and monitor the effectiveness of the CMP and the projects that are being funded. More detail on each of the CMP elements is provided in the subsequent sections of this document.

Figure 1. CMP Structure



Not only is it important to understand how the elements of the CMP interact, it is also important to recognize the CMP's role in the overall regional transportation planning process. The CMP is closely tied to the RTP; as described in Chapter II, the CMP focuses on the Tier One corridors as identified in the RTP. The CMP goals and objectives feed into the overall plan. Both the RTP and the CMP inform the programming of projects in the TIP, the RTP by providing the vision, and CMP by serving as both a filter and incentive. The Annual CMP Performance Reports will illustrate congestion trends in the region, which will inform the next update of the CMP and potentially the way TIP projects are selected. The integration of the CMP into the overall NFR MPO planning process is shown on **Figure 2**.



TIP - Transportation Improvement Program
RTP - Regional Transportation Plan
CMP - Congestion Management Process

Figure 2
CMP within MPO Planning Process

Potential Benefits

In addition to meeting federal requirements, the North Front Range's CMP is intended to benefit the region by:

- Providing measurements of how the region's towns, cities, and counties are doing in terms of managing congestion on an annual basis;
- Guiding project accountability by requiring before and after data collection for all projects funded through the MPO;
- Providing tools and data to inform decisions on how to spend available transportation funding; and
- Providing a basis for pursuing additional transportation funding by "painting" a clear picture of the region's transportation needs.

C. Vision, Goals, and Objectives

The vision for the CMP recognizes that the North Front Range is a growing region.

> ***Vision:*** *Manage the increase in congestion levels on the regional transportation system.*

The congestion management goals and objectives shown in **Table 1** were developed in support of the overall vision.

Table 1. Congestion Management Goals and Objectives

Goals	Objectives
1. Improve Mobility	**1A.** Reduce travel times along Regionally Significant Corridors
	1B. Improve transportation system reliability and reduce unexpected traveler delay for commercial, public, and private users
	1C. Provide transportation alternatives
2. Make the best use of the existing transportation facilities	**2A.** Reduce the demand for travel by implementing TDM programs
	2B. Improve transportation system management and operations
	2C. Collaborate land use planning to help reduce the need for long distance travel

Goals		Objectives	
3.	Decrease reliance on Single Occupancy Vehicles (SOV)	3A.	Increase carpool and vanpool ridership
		3B.	Increase transit ridership on existing services
		3C.	Develop regional and inter-regional transit services and support the development of feeder services to regional routes
		3D.	Encourage active travel by expanding bicycle and pedestrian facilities
4.	Improve accessibility for all modes of transportation	4A.	Encourage local communities to develop land use plans that provide balanced access to all modes of travel
		4B.	Maximize access to alternative transportation systems
5.	Minimize environmental impacts of the transportation system	5A.	Reduce growth in mobile source air pollution emissions
		5B.	Reduce transportation-related fuel consumption

II. CONGESTION IN THE REGION

A. Definition of Congestion

Congestion in the North Front Range MPO is defined as a corridor operating at level of service (LOS) E or F during the peak periods, as calculated in the travel demand model. LOS E on a roadway segment can be defined as a volume to capacity (V/C) ratio between 0.9 and 1.0. LOS F can be defined as a V/C ratio of 1.0 or greater.

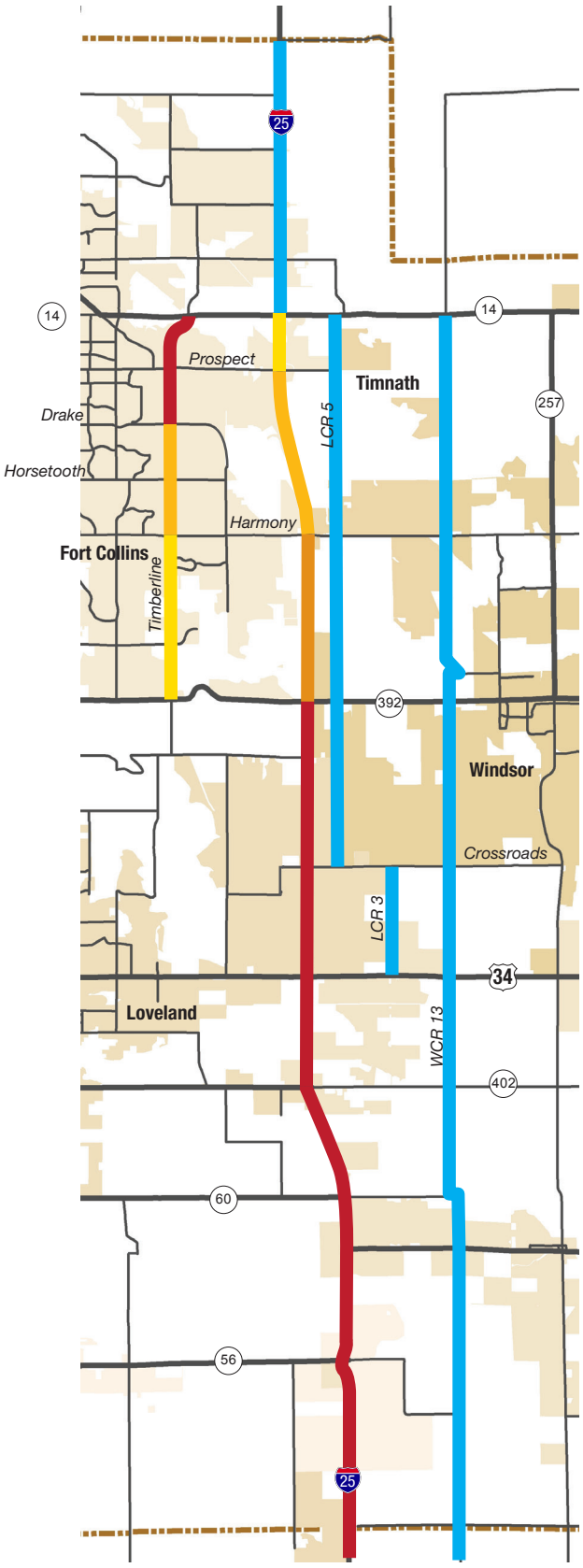
B. Identification of Congested Corridors

The transportation network used for identifying congested corridors in the North Front Range is limited to the Tier One Regionally Significant Corridors. The MPO has gone through the process of identifying and ranking those corridors (as a part of the 2035 RTP planning process) which are most significant to the region in order to focus the limited transportation resources. The facilities within the Tier One RSCs are show in **Table 2**.

Table 2. Tier One Regionally Significant Corridors

Corridor Name	Parallel Facilities
I-25	I-25
	Timberline Road
	Larimer CR 9e
	Weld CR 7
	Larimer CR 5
	Larimer CR 3
	Weld CR 13
US 287	BNSF Railway
	Mason Trail Corridor
	US 287
	Larimer CR 19
	Larimer CR 17
US 34	Big Thompson Trail
	Crossroads/O Street
	US 34
	US 34 Business
	SH 402/Weld CR 54

With the definition of congestion as LOS E or F during the peak periods, the anticipated timing of congestion on segments of the Tier One RSCs can be estimated using travel demand model results. **Figures 3, 4, and 5** identify when congestion is expected to occur (2005, 2015, 2025, or 2035) on the I-25, US 287, and US 34 RSCs, respectively, if no improvements were made to the transportation system. In some cases, the level of service is expected to remain at LOS A – D through 2035; these segments are shown in blue.



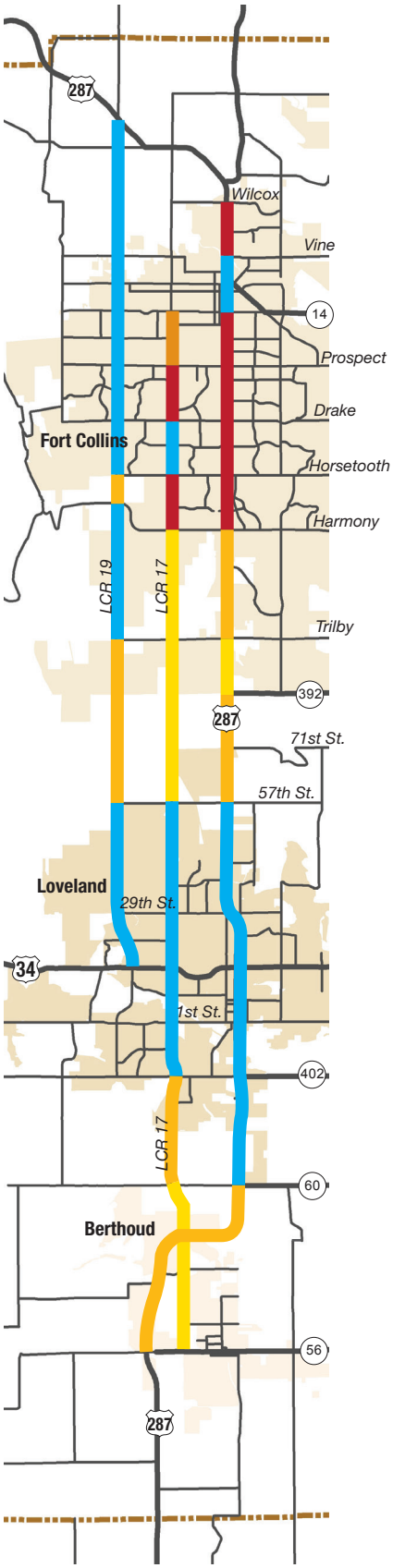
LEGEND

- 2005 Congestion
- 2015 Congestion
- 2025 Congestion
- 2035 Congestion
- No Congestion (LOS A-D)

NOTE: Congestion = Level of Service E or F during Peak Hours

Figure 3
I-25 Corridor Congestion

SOURCE: NFRMPO Travel Demand Model (No Build)



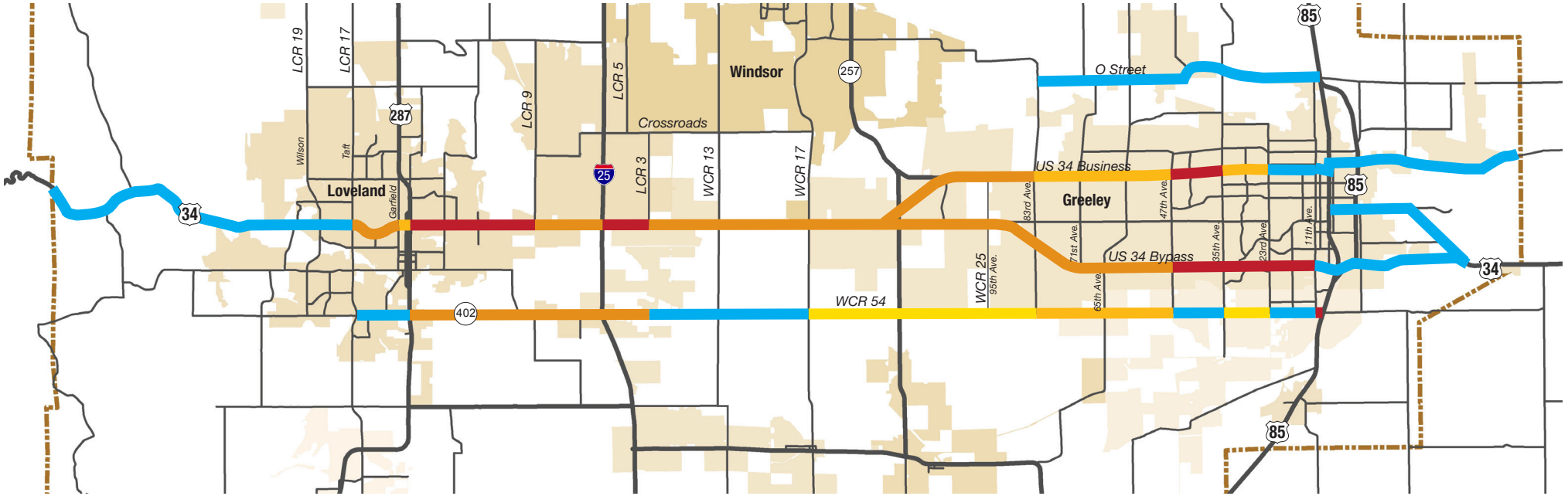
LEGEND

- 2005 Congestion
- 2015 Congestion
- 2025 Congestion
- 2035 Congestion
- No Congestion (LOS A-D)

NOTE: Congestion = Level of Service E or F during Peak Hours

Figure 4
US 287 Corridor Congestion

SOURCE: NFRMPO Travel Demand Model (No Build)



LEGEND

- 2005 Congestion
- 2015 Congestion
- 2025 Congestion
- 2035 Congestion
- No Congestion (LOS A-D)

NOTE: Congestion = Level of Service E or F during Peak Hours

SOURCE: NFRMPO Travel Demand Model (No Build)

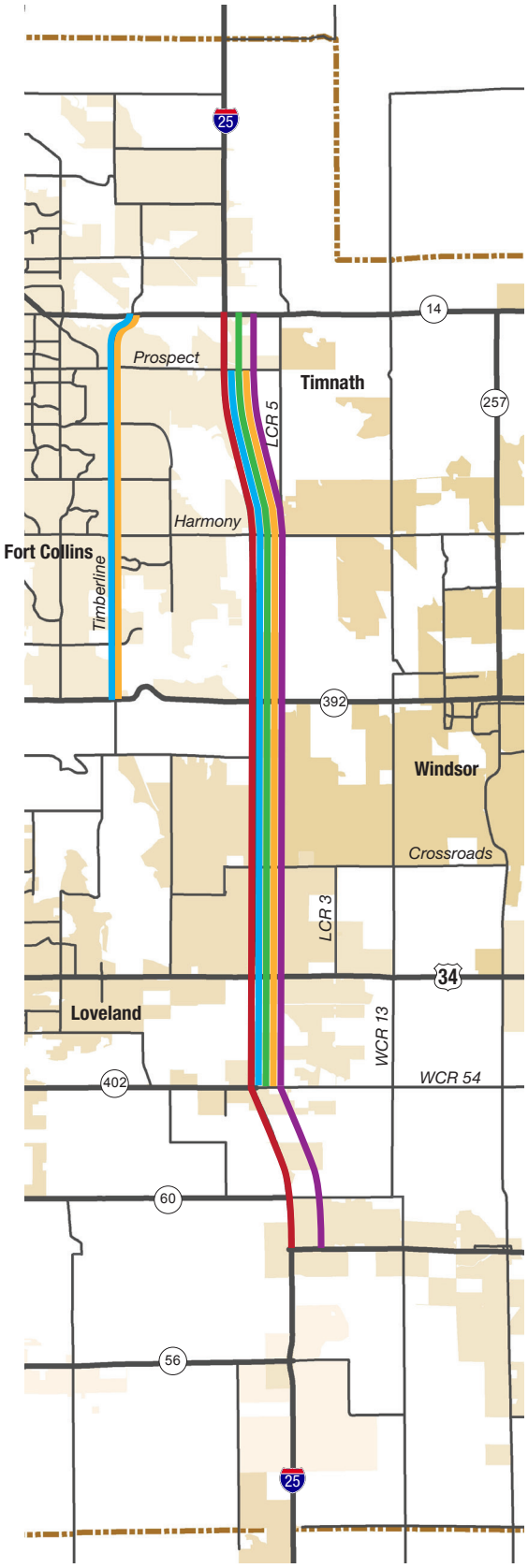
Figure 5
US 34 Corridor Congestion

C. Causes of Congestion

During the development of the CMP in 2007, the North Front Range MPO's TAC examined each of the Tier One corridors (including the parallel facilities) to identify the primary causes of congestion now or in the future. For the purpose of this CMP, the causes of congestion have been categorized as follows:

- **Lack of Parallel Facilities** – Often short, local trips are forced onto high functional classification facilities (i.e., expressways or interstates) when parallel facilities are not available, resulting in congestion.
- **Lack of Other Modes** – When alternative travel modes such as transit or vanpool service, or bicycle/pedestrian facilities are not provided, travelers are forced to drive, resulting in congestion.
- **Need for HOV** – A lack of Travel Demand Management (TDM) techniques such as carpool/vanpool programs or congestion pricing can contribute to congestion along a corridor.
- **Operations** – Inefficient signal timing and progression and/or lack of auxiliary lanes can result in delays and queuing along a corridor.
- **Capacity** – While the CMP focuses on identifying non-roadway capacity expanding solutions to congestion, in some cases, the cause of congestion on a corridor is a result of limited capacity.
- **Other (e.g., Land Use)** – When communities or subareas have an unbalanced jobs/housing mix, travelers are forced to travel long distances for work and other types of trips, resulting in congestion.

The primary causes of congestion have been identified for each segment of the Tier One corridors that is expected to be congested by 2035 on **Figures 6, 7, and 8** for the I-25, US 287, and US 34 corridors, respectively.

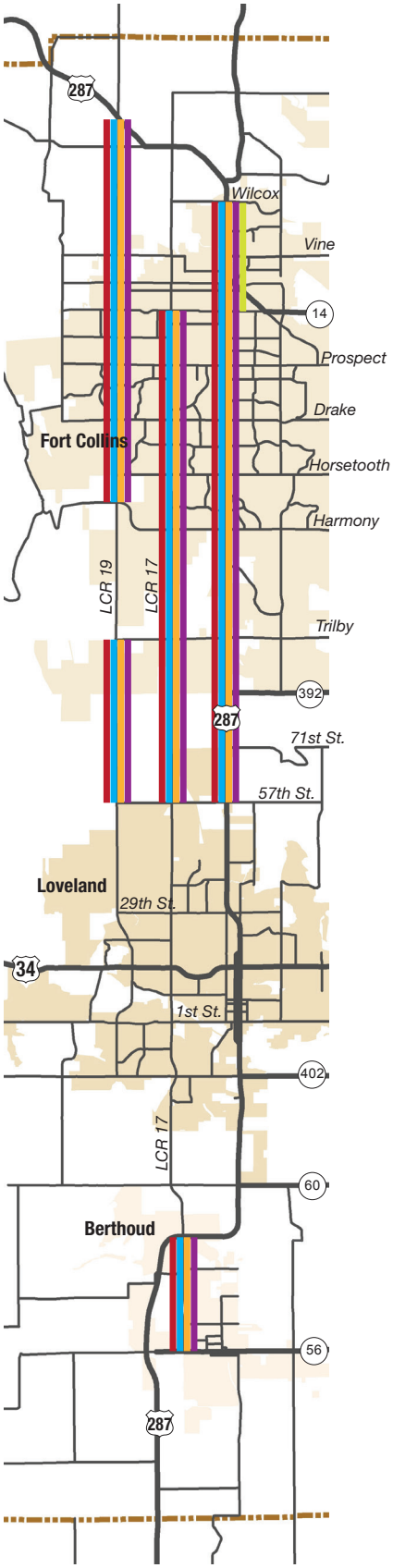


LEGEND

- Lack of parallel facilities
- Lack of other modes
- Need for HOV
- Operations
- Capacity
- Other (e.g. land use)

Figure 6
Causes of Congestion
I-25 Corridor

SOURCE: NFRMPO Travel Demand Model (No Build)

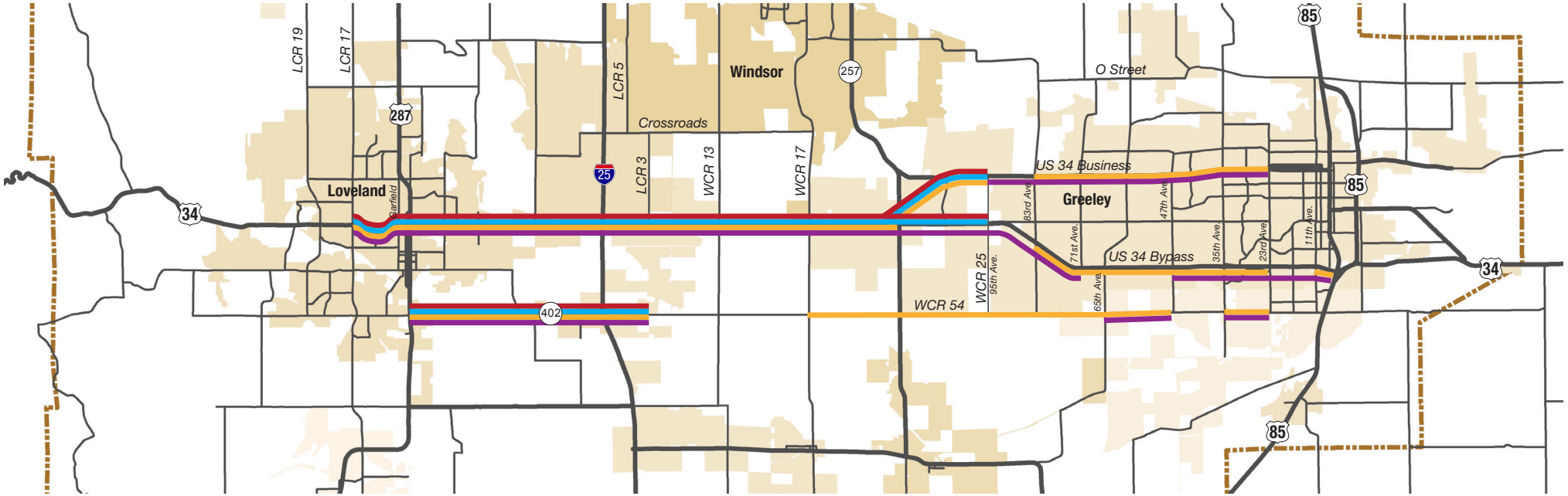


LEGEND

- Lack of parallel facilities
- Lack of other modes
- Need for HOV
- Operations
- Capacity
- Other (e.g. land use)

Figure 7
Causes of Congestion
US 287 Corridor

SOURCE: NFRMPO Travel Demand Model (No Build)



LEGEND

- Lack of parallel facilities
- Lack of other modes
- Need for HOV
- Operations
- Capacity
- Other (e.g. land use)

SOURCE: NFRMPO Travel Demand Model (No Build)

Figure 8
Causes of Congestion
US 34 Corridor

III. CONGESTION MANAGEMENT STRATEGIES

There are a variety of strategies that can be employed to address congestion in the North Front Range. **Table 3** presents a menu of strategies that could be used to address the cause(s) of congestion identified for the segments of the congested Tier One corridors. The congestion management objectives (refer to **Table 1**) that would be addressed by each strategy are listed in **Table 3**. This menu of strategies has been intentionally generalized to accommodate potential new technologies in transportation. The categorization is for organizational purposes and strategies in the same or different categories may overlap. Often a comprehensive set of strategies can be more effective at relieving congestion than a single congestion management strategy.

The federal regulations specify that all reasonable congestion management strategies must be evaluated and deemed ineffective or infeasible prior to considering a roadway capacity increase as a congestion management approach.

Table 3. Congestion Management Strategies

Category	Strategy	Objective(s) Addressed
Access Management	Access control	1A, 1B
	Frontage roads	1A, 1B
	Median control	1A, 1B
Alternative Travel Modes	Transit fleet and facilities expansion	1C, 3B, 3C
	Transit service expansion	1C, 3C
	Transit priority treatments	3B, 3C
	Transit information systems	3B, 3C
	Bus only lanes	1C, 3B, 3C
	New rail service	1C, 3C
	Improved intermodal connections	1C, 4B
	Improved/expanded bicycle/pedestrian network	1C, 3D
	Bicycle/pedestrian amenities	1C, 3D
Travel Demand Management/ Congestion Pricing	Telecommuting	2A, 5A, 5B
	Flextime/compressed work week	2A, 5A, 5B
	Vanpool/carpool services	1A, 2A, 3A
	Parking management/preferential parking (for vanpools/carpools)	2A, 3A, 5A, 5B
	Road user fees (toll lanes)	2A, 5A, 5B
	Park-and-ride facilities	1C, 3A, 4B
	HOV/HOT lanes	2A, 5A, 5B

Category	Strategy	Objective(s) Addressed
Land Use Considerations	Adequate Public Facilities regulations	2C, 4A
	Impact fees	2C, 4A
	Land use regulations/growth management	2C, 4A
	Land use plans	2C, 4A
Operational Improvements	Intersection geometric improvements	1A, 2B
	Intersection channelization	1A, 2B
	Intersection turn restrictions	1A, 2B
	Intersection signalization improvements	1A, 2B
	Intelligent Transportation Systems (ITS)	1A, 2B
	Coordinated signal systems	1A, 2B
	Elimination of bottlenecks on freeways	1A, 1B
	Ramp metering	1A, 2B
	Incident management	1B
Capacity Expansions[1]	Freeway lanes	1A
	Arterial lanes	1A

[1]All reasonable congestion management strategies must be evaluated and deemed ineffective or infeasible prior to considering a roadway capacity increase.

IV. SYSTEM MONITORING

The system monitoring element of the CMP outlines an annual data collection program that will track the progress of the region in terms of congestion and is focused on the Tier One RSCs and the region as a whole. Results of the system monitoring will be incorporated into the Annual CMP Performance Report. The first step in establishing an annual system monitoring program is to identify appropriate performance measures that address the region's congestion management goals and objectives.

A. Performance Measures

A performance measure is a quantifiable measure to assess how well the communities of the North Front Range region are meeting the established congestion management goals and objectives. Performance measures serve as indicators to better understand the usage of a transportation facility or the characteristics of travelers using the transportation system. A measure may refer to the experience of a traveler on a trip between a particular origin and destination, it may summarize all trips on a particular corridor, or it may describe the operation of one mode of transportation versus another.

Previously, several of the performance measures used in the North Front Range CMP were extracted from the regional travel demand model. Although the model is an important and useful tool in the transportation planning process, it is only updated and calibrated every four years. The model lacks the ability to report annual changes in use and operation of the transportation system.

This CMP update aims to establish a set of performance measures that can be calculated from real world data on an annual basis and that will provide the North Front Range MPO with useful information and trends to inform transportation investment decisions. The following considerations were taken into account in establishing performance measures:

- Performance measures should reflect the region's congestion management goals and objectives.
- Performance measures should be relevant and should speak to the user's experience.
- Performance measures should be simple and understandable by the general public.
- Performance measures need to be based on readily available data.
- Performance measures should be meaningful both at a regional/corridor level as well as a project level.
- The mix of performance measures should address all modes of travel and should address both the supply and demand sides of transportation.
- The number of performance measures should be limited to avoid diluting the importance of any single indicator and to simplify output.
- While some performance measures may be in conflict with one another, the mix of performance measures should provide an understanding of the "state of the region" in terms of managing congestion.
- Performance measures should provide benchmarks for continued improvement and value in making investment decisions.

The performance measures established for the CMP are shown in **Table 4**, and are grouped into four categories. The primary objective(s) (refer to **Table 1**) reflected in each of the performance measures are noted.

Table 4. Performance Measures

Category	Performance Measure	Objective(s)
Mobility	Travel time via auto and via bus	1A, 2B, 3B
	V/C ratios	1B
	Lane miles and hours of congestion	1A
	Transit one-way lane miles and number of trips	3C
	Number of accidents	1B
Accessibility	Miles of bicycle and pedestrian facilities	1C, 3D, 4B
	Population and employment within ¼ mile of transit service	1C, 3B, 4B
	Population within 3 miles of park-and-ride facilities	3A, 3B
	VMT per capita	2C, 4A
	Jobs/Housing balance	2C, 4A
Mode Shift	Average vehicle occupancy	1C, 2A, 3A, 3B
	Vanpool/carpool ridership	1C, 2A, 3A
	Transit ridership	1C, 3B
	Bicycle and pedestrian volumes	1C, 3D
	Number of employer-based TDM programs	2A
	Number of employees participating in TDM programs	2A
Environmental	Mobile source air pollution emissions	2A, 2B, 5A
	Transportation-related fuel consumption	2A, 5B

A description of the data collection requirements and how each of the performance measures could be calculated is included in Chapter VI.

V. TIP PROJECT CMP CONSISTENCY

As depicted in **Figure 2**, the CMP not only provides a vision for managing congestion as part of the RTP and a mechanism for reporting regional trends, it also serves an important role in the selection of projects for the Transportation Improvement Program (TIP). The CMP's role in the TIP project selection process can be divided into three functions, as described in the following sections.

A. Project Filter

The federal regulations specify that all reasonable congestion management strategies must be evaluated and deemed ineffective or infeasible prior to considering a roadway capacity increase as a congestion management approach. The intention of this requirement is to ensure consideration of viable solutions to mitigate congestion that may be more cost effective and with less environmental impact than roadway capacity expansions. For the purpose of the CMP, roadway capacity expansion is defined as additional general purpose through lane capacity.

Since the CMP is focused on Tier One RSCs, any project on a Tier One corridor that is applying for federal or state funding through the North Front Range MPO must be consistent with the CMP. If a project includes roadway capacity expansion for general purpose lanes, the project application must provide documentation of a thorough evaluation of alternative congestion mitigation strategies. The evaluation should demonstrate that alternative strategies would be ineffective at relieving congestion or would be infeasible, and that capacity expansion has been deemed the best solution.

Additionally, any roadway capacity expanding projects on Tier One corridors should incorporate alternative congestion management strategies (such as ITS infrastructure, TDM programs, or transit priority treatments) into the overall project.

B. Project Requirements

In support of the CMP, all projects (regardless of the RSC tier) vying for federal or state funding through the NFR MPO must:

1) Identify the primary objective(s) of the project
2) Identify performance measures to assess how well the project meets its intended objective(s)
3) Commit to before and after data collection in support of the stated performance measures

The before and after data for each completed project will be compiled by the MPO and documented in the Annual CMP Performance Report. This information will establish a database of performance measures that documents the effectiveness of various project types at mitigating congestion (or other project-specific objectives).

C. Project Incentives

The Surface Transportation Program (STP-Metro) is the most flexible of the federal funding sources administered by the North Front Range MPO. The project selection process for STP-

Metro projects (September 2010) involves evaluating how well a project addresses six evaluation criteria. One of the evaluation criteria is "Congestion Mitigation," and 21 percent of the project's score is based on how well it addresses this evaluation criterion. Projects that are in areas that currently experience congestion throughout the peak periods and that would significantly reduce congestion are awarded a higher score in this category than projects that either are in areas that are not currently congested or that would only moderately reduce congestion. This evaluation criterion applies to all projects competing for STP-Metro funding, not just those on Tier One corridors.

VI. ANNUAL CMP PERFROMANCE REPORT

The NFR MPO publishes an Annual Congestion Management Process Performance Report at the close of each federal fiscal year. At the end of the State Fiscal Year 2011 (FY11), the CMP Performance Report will be reformatted to focus on reporting the system-wide and project-level data collection and performance measures outlined in this document. The first year will establish the baseline for the system-wide performance measures; in subsequent years, the CMP Performance Report will document and analyze the trends for each of the performance measures. The following sections describe the data collection needs and the information that should be included in the Annual CMP Performance Report.

A. System Monitoring Performance Measures

An annual data collection effort will be required to measure how effectively the region is managing congestion. An outline of the data collection effort recommended to address each of the performance measures is provided below, along with the agencies responsible for collecting the data. The system-wide data collection effort will be focused on the Tier One corridors, or region-wide, as appropriate for the particular performance measure.

Travel Time

Travel time studies should be conducted along the three primary Tier One corridors (I-25, US 287, and US 34 only) during the peak periods. The primary corridors should provide a cost effective indication of the travel time operations of the corridor (including parallel facilities) as a whole and for transit services operating on the Tier One corridors. (Responsibility: NFR MPO)

Volume to Capacity Ratios

Volume to capacity ratios should be calculated based on the average daily traffic (ADT) on Tier One corridor segments and planning-level capacities as estimated in the regional travel demand model. CDOT has automatic traffic recorders (ATRs) at two locations on Tier One corridors (Responsibility: CDOT):

- I-25 north of the Mountain Vista interchange in Fort Collins
- US 34 east of County Line Road (Weld CR 13)

To supplement these ATR counts, three radar counts are sought on each of the three primary Tier One corridors (I-25, US 287, and US 34). (Responsibility: NFR MPO)

Twenty-four hour tube counts should be recorded on other Tier One facilities in coordination with the local agencies' regular traffic count programs. (Responsibility: NFR MPO and Local Agencies)

Lane Miles and Hours of Congestion

All ADT counts described above should be recorded on an hourly and directional basis. Using planning-level hourly capacities as estimated in the travel demand model, the number of lane miles of congestion and lane hours of congestion can be calculated. To be cost effective, this performance measure would necessarily be at a planning-level and would not account for corridor-specific operational conditions.

Transit One-Way Lane Miles and Number of Trips

The number of one-way transit lane miles on Tier One corridors and the number of one-way transit trips on each Tier One corridor should be calculated. (Responsibility: Local Transit Agencies)

Number of Accidents

The number of accidents is a surrogate measure for non-recurring congestion; accidents along a Tier One corridor result in expected delays and unreliable travel times. Accident data are maintained by the CDOT for all state highways and by local jurisdictions for non-state highway routes. Although there tends to be a lag of one to three years in reporting accident data, the most current accident data should be compiled for all Tier One corridors. (Responsibility: CDOT and Local Agencies)

Miles of Bicycle and Pedestrian Facilities

This measure provides an indication of the extent to which travelers are able to choose an alternative mode of travel within the Tier One corridors. The miles of bicycle and pedestrian facilities within a ¼ mile buffer of the Tier One corridors should be calculated using the GIS database which includes bicycle and pedestrian facility mapping. (Responsibility: NFR MPO and Local Agencies)

Population and Employment within ¼ Mile of Transit Service

This performance measure should be calculated as the percentage of the region's total population and employment that is located within ¼ mile (typical distance a person is willing to walk to get to transit) of transit routes. This will be provided in aggregate and for each route on a Tier One corridor. The population and employment data will come from the travel demand model (which is only updated every four years), but any updates to the transit service or routing should be updated annually to calculate this measure. (Responsibility: NFR MPO and Local Transit Agencies)

Population within 3 Miles of Park-and-Ride Facilities

This performance measure should be calculated as the percent of the region's total population that is located within three miles (typical catchment area) of existing park-and-ride facilities. The population data will come from the travel demand model (which is only updated every four years), but any new park-and-ride facilities should be updated annually to calculate this measure. (Responsibility: NFR MPO and Local Agencies)

VMT per Capita

This measure is intended to quantify the average distance traveled per person on the Tier One corridors. The vehicle miles of travel (VMT) can be calculated using the ADT counts on Tier One corridors as previously described multiplied by the segment length. The denominator (population) will come from the travel demand model (which is only updated every four years). (Responsibility: NFR MPO)

Jobs/Housing Balance

This measure addresses the availability of different land uses within each community or subarea within the North Front Range. A balance of jobs and housing reduces the need for long distance travel. The jobs/housing balance can be calculated using travel demand model land use data for the base year; this measure will only be updated every four years, when the model is updated. (Responsibility: NFR MPO)

Average Vehicle Occupancy

The average number of occupants per vehicle is an indicator of the level of carpooling, vanpooling, and transit ridership that occurs along a corridor. Vehicle occupancy counts should be conducted at two locations on each of the three primary Tier One corridors (I-25, US 287, and US 34). The primary corridors should provide a cost effective indication of vehicle occupancy of the corridor (including parallel facilities) as a whole. (Responsibility: NFR MPO)

Vanpool/Carpool Ridership

VanGo™ vanpooling service is available in the North Front Range region. NFR MPO Smarttrips™ tracks the number of vans and riders in operation annually. This will be provided in aggregate and for each Tier One corridor. CarGo™ carpool matching services, offered through Smarttrips™, currently measures the aggregate number of carpoolers enrolled in the Smarttrips™ program in the region. With the launch or the new Smarttrips™ website, the number of Smarttrips™ carpoolers traveling in each Tier One corridor will be available. An estimate should be provided on the additional carpools that exist in the region outside of those enrolled in the Smarttrips™ program. (Responsibility: NFR MPO)

Transit Ridership

Transit ridership data are commonly used by transit agencies to measure the effectiveness of transit services. Transit ridership will be tracked throughout the NFR region in aggregate and for those routes that travel on the Tier One corridors. (Responsibility: Local Transit Agencies)

Bicycle and Pedestrian Volumes

CDOT has recently initiated a statewide bicycle and pedestrian count program, in which the NFR MPO will participate. The locations of the bicycle and pedestrian counts in the region are to be determined. (Responsibility: CDOT, NFR MPO, and Local Agencies)

Number of Employer-Based TDM Programs

The NFR MPO currently conducts business outreach with many employers in the NFR through the Smarttrips™ program. As part of this business outreach, staff of the NFR MPO can track the number of employers with TDM programs. A supplement to staff knowledge of employer-based TDM programs is the regional bi-annual TDM survey recommended for implementation in the *NFRMPO Long Range TDM Plan*. (Responsibility: NFRMPO)

Number of Employees Participating in TDM Programs

The number of employees participating in TDM programs will be summarized from two sources as recommended in the *NFRMPO Long Range TDM Plan*. First, the regional bi-annual TDM survey can be used to estimate the number of employees participating in TDM programs.

Second, any TDM program directly supported or funded by the NFR MPO through CMAQ or other regional grants should be measured through site-based surveys that capture more detailed information about program effectiveness. (Responsibility: NFRMPO)

Mobile Source Air Pollution Emissions

This performance measure is an indicator of the environmental impacts of transportation in the region. The air emissions can be calculated based on the vehicle-miles of travel along the Tier One corridors (using ADT counts) and air emissions factors from Mobile6. (Responsibility: NFR MPO)

Transportation-Related Fuel Consumption

This performance measure is also an indicator of the environmental impacts of transportation in the region. Fuel consumption can be calculated based on the vehicle-miles of travel along the Tier One corridors and the fleet mix. Vehicle classification counts will be needed to for this performance measure. (Responsibility: NFR MPO)

B. Programmed and Implemented Projects

The Annual CMP Performance Report should provide a summary of the projects on Tier One corridors that have been selected for funding in the TIP, including documentation of CMP consistency. Tier One projects intended to relieve congestion should be categorized by the congestion management strategies in Chapter III.

For the Tier One projects that have been implemented within the fiscal year, the before and after data collection and performance measures should be documented in the CMP report. Over time, the database or project types and before and after performance measures will allow the MPO to identify the types of projects that are most effective at relieving congestion and improving mobility.

Additionally, the CMP performance report will document all local agency projects that have been implemented on Tier One corridors, although before and after data collection and performance measures will likely not be available for most of these projects.

C. Trends

It will be important not only to document the CMP system-wide and project-level performance measures, but also to evaluate the trends in the performance measures over time and identify and analyze the factors affecting congestion-related performance measures. The Annual CMP Performance Report should answer the question, "Are we making progress toward meeting the congestion management goals and objectives?" Factors affecting the congestion-related performance measures might include:

- **Projects that have been implemented and provide congestion relief**. With limited transportation funding available, most of the projects implemented in the region have only a localized congestion relief benefit. This is an important consideration in comparing the transportation needs to the scale of projects that can be implemented with limited funds. Are the projects being funded through the MPO able to contribute to the regional congestion management? Are the projects effective at alleviating congestion at a localized level?

- **Population and employment growth**. In a growing region such as the NFR MPO, it is important to place the congestion-related performance measures in the context of growth. Are increases in congestion levels proportionate to population and employment growth?
- **Gas prices**. The cost of travel plays a significant role in the behavior of the traveling public. When gas prices rise, people are much more willing to use alternative transportation modes such as transit, carpooling/vanpooling or bicycling/walking. How have gas prices or other behavior-changing factors affected the levels of congestion in the region?
- **Mode share trends**. The percent of commuters traveling by single occupancy (SOV), high occupancy vehicles (HOV), transit, bicycle, walking, or working from home have an effect on the levels of congestion experienced on the transportation network. Mode share information is gathered by the MPO approximately every 10 years through the household travel survey.
- **Lack of fiscal resources**. The Annual CMP Performance Report may demonstrate that the region is not able to keep up with congestion because of a lack of transportation funding. The NFR MPO and its member governments are often competing on a national level for transportation funding, and it is of critical importance to be able to provide a clear picture of the region's unmet transportation needs.

VII. NEXT STEPS

The outline of region-wide data collection needs provided in Chapter VI should be fleshed out in preparation for the Annual CMP Performance Report at the end of FY2011. The initial set of data compiled at for the FY2011 CMP Performance Report will serve as the baseline for comparing congestion trends in the region from year to year.

The next major update of the NFR MPO's Congestion Management Process will be a component of the 2040 RTP. At that time, the definition of the CMP network and the identification of congested corridors may be revisited. The following considerations have been suggested as possible modifications to the CMP in the future:

- Update the identification of currently congested corridors based on actual data collected through the region-wide data collection program, rather than using travel demand model results.
- Reconsider the network for which the CMP applies; the CMP may not be as appropriate to rural portions of the Tier One corridors as the portions that are in urban areas.

The CMP may also be expanded to include new objectives, performance measures, and/or strategies for mitigating congestion.

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