



2035 Statewide Transportation Plan

Freight

TECHNICAL REPORT

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INTRODUCTION

Since the early days of the United States of America, the economy of the country has been built upon, and has heavily relied upon, the transportation system. In the 18th century the economy depended upon water transport and coastal trade. The 19th century brought the rise of rail technology and expansion. And with the development of a highway system linking regional economies in all directions, the trucking industry became a key mode of transporting commerce in the 20th century.

The amount of freight moved on the national transportation network is vast. In 2002, according to the *Freight Analysis Framework (FAF)* published in 2006 by the Federal Highway Administration Office of Freight Management and Operations, over 19.3 billion tons of goods were transported, with nearly 17.7 billion tons moved domestically. These goods had a total value of over \$13 trillion. This is equivalent to, on average, 53 million tons of freight worth \$36 billion each day. Nationwide, trucks transport about 60 percent of this freight (by weight), and rail is responsible for about 10 percent. Bulk products (coal, gravel, grains, crude petroleum, etc.) comprise nearly two-thirds of the tonnage, but only one-fifth of the value of the goods moved. Based on value, machinery, electronics, motor vehicles, textiles, pharmaceuticals and other manufactured goods comprise over two-thirds of the products moved.

As the economy of the country continues to grow, the demand on the freight network in the United States will also grow. The FAF projects that the total freight moved on the network will approximately double by the year 2035. Yet the system is already reaching its capacity, and there is no national program focused on improving the flow of freight. Organizations within the transportation industry are discussing and proposing concepts for such a program. As an example, the American Road and Transportation Builders Association (ARTBA) has developed the Critical Commerce Corridors program (3C System), which proposed the development of a national freight strategy to facilitate the efficient, reliable and secure movement of freight so the United States can retain and improve its global competitiveness.

PROFILE OF FREIGHT IN COLORADO

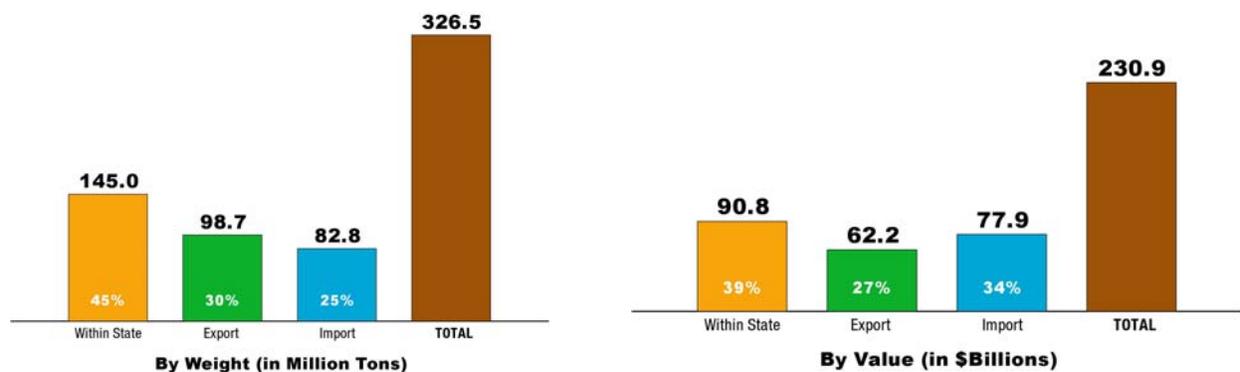
Like the rest of the nation, the Colorado economy relies heavily on the state's freight transportation network. Historically rich in natural resources and with an economy based in large part on agriculture, Colorado has a need to transport large quantities of commodities. The state's rapid growth also requires considerable amounts of goods and products to support that growth. As a result, there are substantial volumes of freight being transported within the state.

Furthermore, Colorado is strategically located as a "bridge" state in the national and international infrastructure for the movement of freight, resulting in large quantities of goods flowing through the state. Although this has been predominately in the east-west direction, the North American Free Trade Agreement (NAFTA) and the development of the Ports to Plains Corridor and the Heartland Expressway have begun to place Colorado in a more significant role in the movement of goods in the north-south direction as well.

Existing Freight Characteristics in Colorado

According to the FAF data base, there were 326.5 million tons of freight shipped in Colorado in 2002, with a total value of over \$ 230 billion. **Figure 1** summarizes these data by both weight (millions of tons) and value (billions of dollars). The figure shows how much freight stays within the state, how much leaves the state (export) and how much comes into the state (import). As shown, by weight, approximately 45 percent of the total tonnage stays within Colorado, and more tonnage is exported than is imported. Based on value, the picture changes. The portion of freight staying within Colorado drops to 39 percent, while the amount imported is greater than the value of the exported freight.

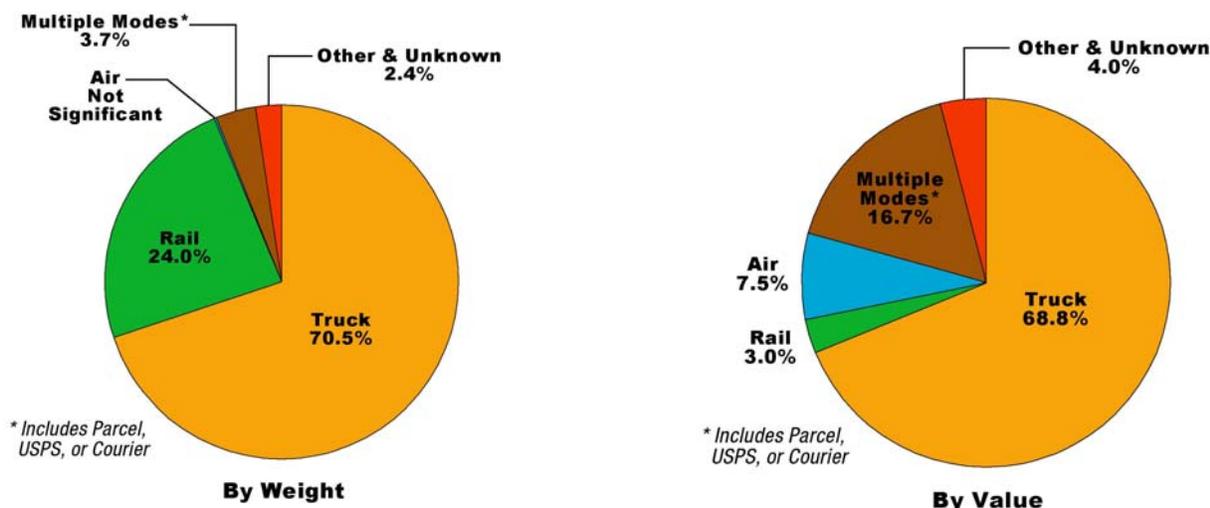
Figure 1. 2002 Colorado Freight Shipments



Source: *Freight Analysis Framework*, FHWA Office of Freight Management and Operations, 2006

Figure 2 depicts the mode of transportation used for shipping of freight originating in Colorado, including that staying in Colorado. By weight, over 70 percent of the freight is hauled by truck and 24 percent is carried by rail. When one considers the mode breakdown based on the value of the goods being moved, there are some significant changes. While trucks continue to carry nearly 70 percent of the freight, rail drops to only 3 percent of the value and air increases from being not significant to about 7.5 percent of the total. Likewise, multiple modes (which includes Parcel, USPS and courier) increases to nearly 17 percent.

Figure 2. Transportation Mode for Shipments Originating in Colorado



Source: 2002 Commodity Flow Survey, USDOT, Bureau of Transportation Statistics

The primary commodities moved also differ when considered on the basis of weight or the basis of value. The following is a breakdown of the top commodities and the percent which they represent of the total freight staying within, leaving or entering the state.

By Weight

Within Colorado	
Nonmetallic mineral products	18.4 %
Gravel	14.6 %
From Colorado	
Coal	36.4 %
Coal and petroleum products	34.8 %
To Colorado	
Coal and petroleum products	39.3 %
Coal	12.3 %

By Value

Within Colorado	
Machinery	22.3 %
Mixed freight	11.4 %
Electronics	5.5 %
From Colorado	
Coal and petroleum products	16.8 %
Electronics	12.1 %
Mixed freight	11.0 %
To Colorado	
Electronics	13.2 %
Coal and petroleum products	12.7 %
Motorized vehicles	7.7 %

As readily evidenced from these data, the largest quantities of goods moved are bulk products, mostly related to natural resources. However, based on value, the majority of products moved are generally manufactured goods, with electronics, machinery and motorized vehicles on the list.

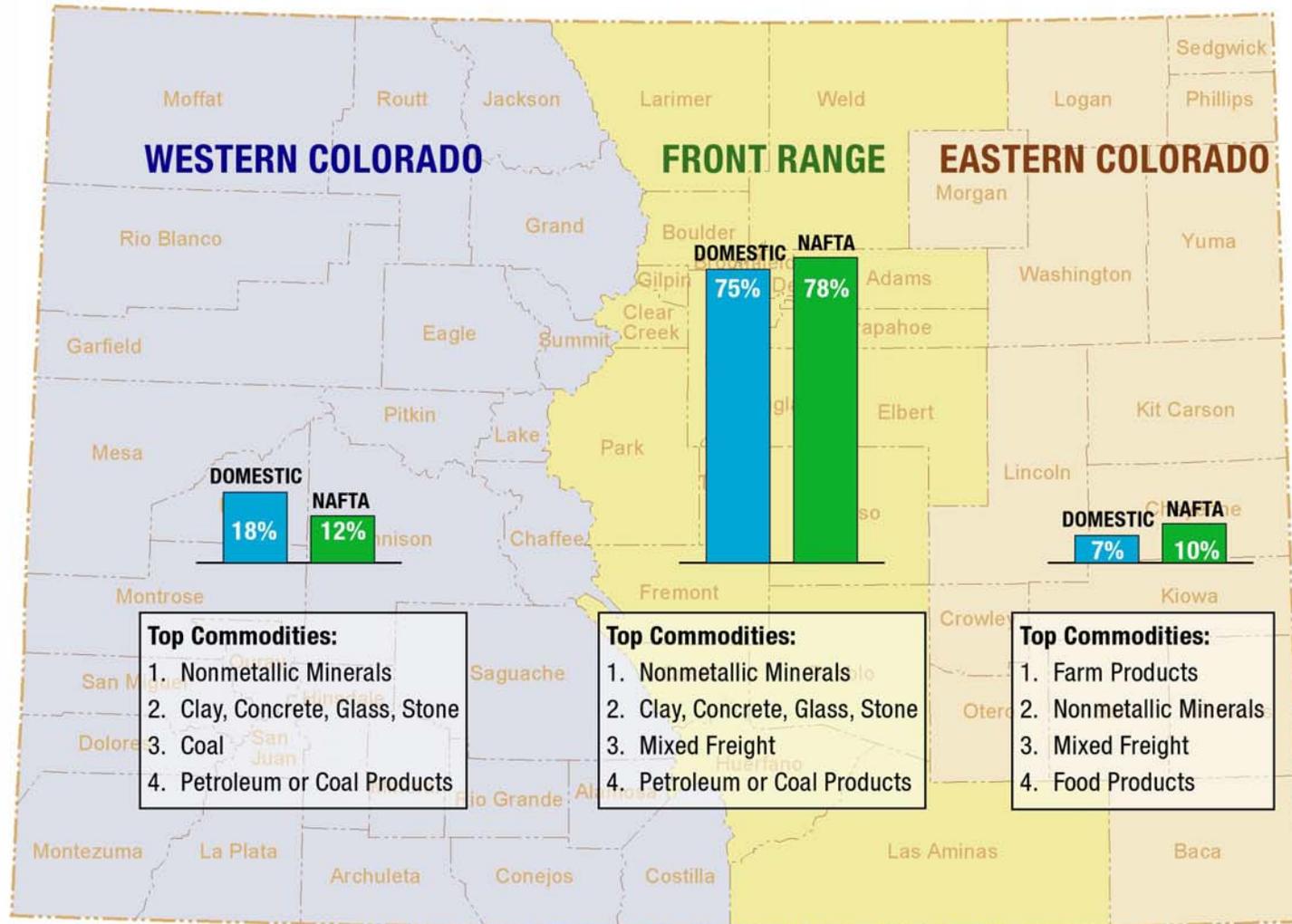
Colorado's top trading partners for bulk products are nearby states, including Wyoming, New Mexico, Nebraska and Arizona. Based on the value of the goods moved, the top trading partners domestically are California, Wyoming, Texas and Nebraska.

International trading represents 3 to 4 percent of Colorado's trade outside of the state. Canada continues to be the largest international market, at more than \$1.4 billion in 2003, representing 23 percent of all foreign sales. Mexico is the second largest market. Other international markets include Japan, Korea, China, Malaysia and European countries.

All of the above freight data reflects statewide characteristics. Another source of data which provides information on county-level tonnage (the database does not include information on value of the freight) is the Global Insights TRANSEARCH database. The database purchased by CDOT contains data for 2004. This information has been researched in order to provide relative order-of-magnitude estimates of freight tonnage associated with each of three major areas of Colorado: Eastern Colorado, Front Range and Western Colorado. Although the boundaries of these regions do not exactly coincide with the boundaries of Transportation Planning Regions, they reflect, as much as possible, commonalities in regard to freight characteristics. They are also consistent with those previously utilized in the *Eastern Colorado Mobility Study* when defining Eastern Plains counties and Front Range counties. These areas and the relative amounts of freight in and out of the three areas are illustrated on **Figure 3**.

As shown, the Front Range dominates the freight movements in Colorado, with over three-quarters of both the statewide domestic freight and the statewide NAFTA-related trade. Domestically, Western Colorado transports more than twice the freight as does Eastern Colorado. However, when it comes to NAFTA-related freight, the two regions are fairly similar.

Figure 3. Regional Freight Characteristics



Source: 2004 TRANSEARCH Data Base, Global Insights

The figure also depicts the top commodity groups which are transported in or out of each of the regions. As one would expect, the freight of Western Colorado is predominately related to natural resources, while the freight of Eastern Colorado is largely agriculturally based. The Front Range freight includes a broader mix of commodity types, although some of the top commodity groups also relate to natural resources.

Future Projections of Freight in Colorado

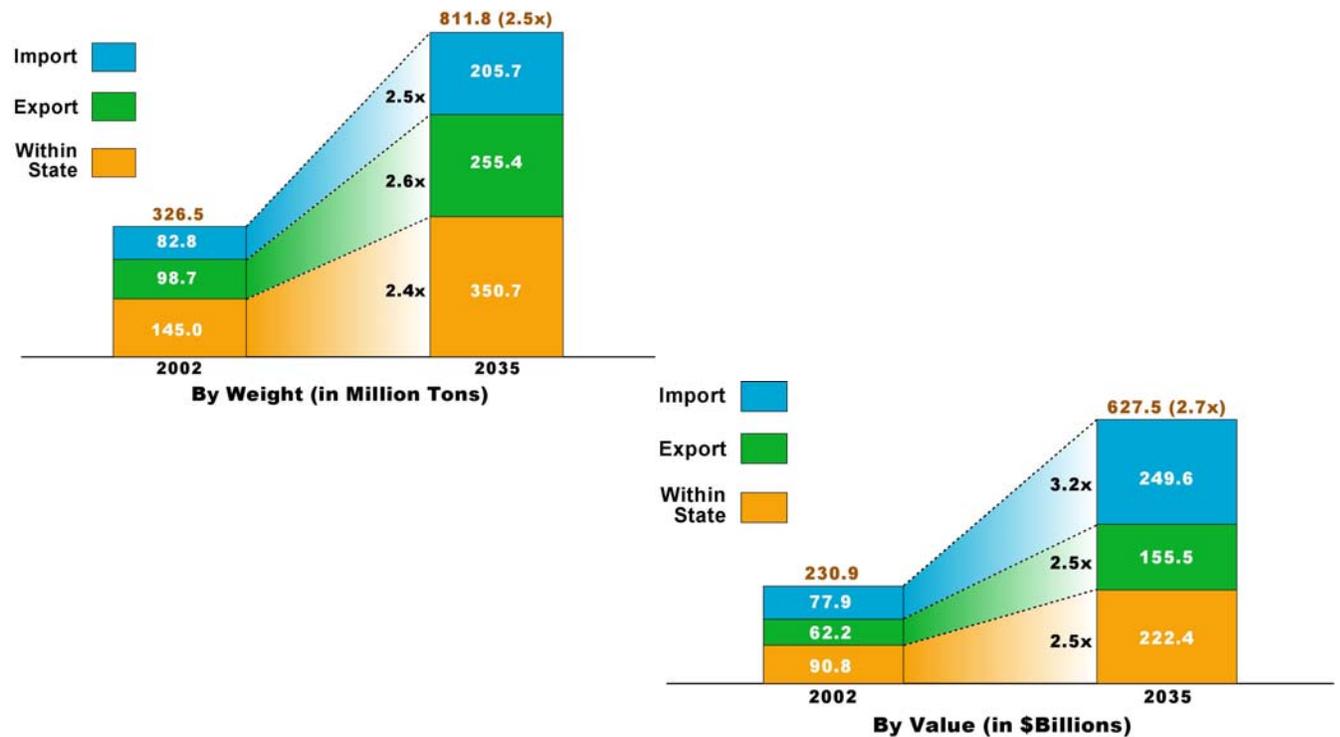
As noted earlier, national projections suggest that freight movements in the country will double by the year 2035. Colorado freight is expected to grow at an even more rapid rate. **Figure 4** summarizes the growth projections for Colorado freight, both by weight and by value.

Based on weight, total Colorado freight is projected to grow by a factor of 2.5 by 2035. The greatest growth rate is projected to be in exports, with a factor of 2.6.

Based on value, Colorado freight is expected to grow by a factor of 2.7. While freight staying within Colorado and exports are projected to grow by a factor of 2.5, the value of imports is estimated to grow by a factor of 3.2.

Such growth in freight will place ever increasing demands on the transportation network in Colorado.

Figure 4. Projected Growth of Freight in Colorado



Source: *Freight Analysis Framework*, FHWA, Office of Freight Management and Operations, 2006

FREIGHT SYSTEM IN COLORADO

As noted by the modal distribution of freight in Colorado, there are a number of elements that comprise the network used by freight haulers. Each of these elements is briefly discussed in this section.

Highways

With the vast majority of freight in Colorado being transported by trucks, the highway system plays a vital role in the transport of goods for movements within the state as well as for exports and imports. As one would expect, the greatest concentration of truck traffic is on the Interstate highways in Colorado, I-25, I-70 and I-76. As illustrated on **Figures 5 and 6**, these highways are well situated to serve both domestic and international truck traffic hauling freight to and from Colorado. (It should be noted that these maps represent 1998 data because the maps prepared from the updated *Freight Analysis Framework* have not yet been prepared by FHWA. While the patterns are likely to be similar, the updated maps can be expected to show greater volumes on these highways.)

Figure 7 has been prepared from 2006 CDOT data to illustrate truck volumes throughout the state. Like the federally prepared maps, this map shows that the greatest concentrations of truck traffic are experienced on the Interstate highways. One exception is the Ports to Plains Corridor along US 40 and US 287 in eastern Colorado. The heaviest truck volumes are experienced in the Denver Metropolitan Area, particularly near the confluence of the Interstate highways. The highest truck volumes in the state are on I-25 between I-76 and US 36, at 12,000 trucks per day. In the Denver area, more than 17,000 trucks per day traverse the interchange of I-25 and I-70, while about 10,000 trucks per day go through the I-70/I-225 interchange.

Railroads

According to data published by the Association of American Railroads for 2005, the total rail miles operated in the state (including trackage rights) is slightly more than 3,500 miles. There are two Class I railroads operating in Colorado: the Union Pacific (UP) Railroad and the Burlington Northern Santa Fe (BNSF) Railroad. The Union Pacific operates on the most rail mileage in the state, at 1,530 miles (approximately 44 percent of the total rail mileage in Colorado). The BNSF operates on 1,400 miles, about 40 percent of the state's rail miles. In addition, there are 11 regional, local or switching and terminal railroads; these lines account for the remaining 16 percent of rail miles operated in Colorado. There are nearly 3600 rail employees living in Colorado. **Figure 8** illustrates the Colorado rail network.

Figure 5. Colorado Domestic Truck Flow (1998)

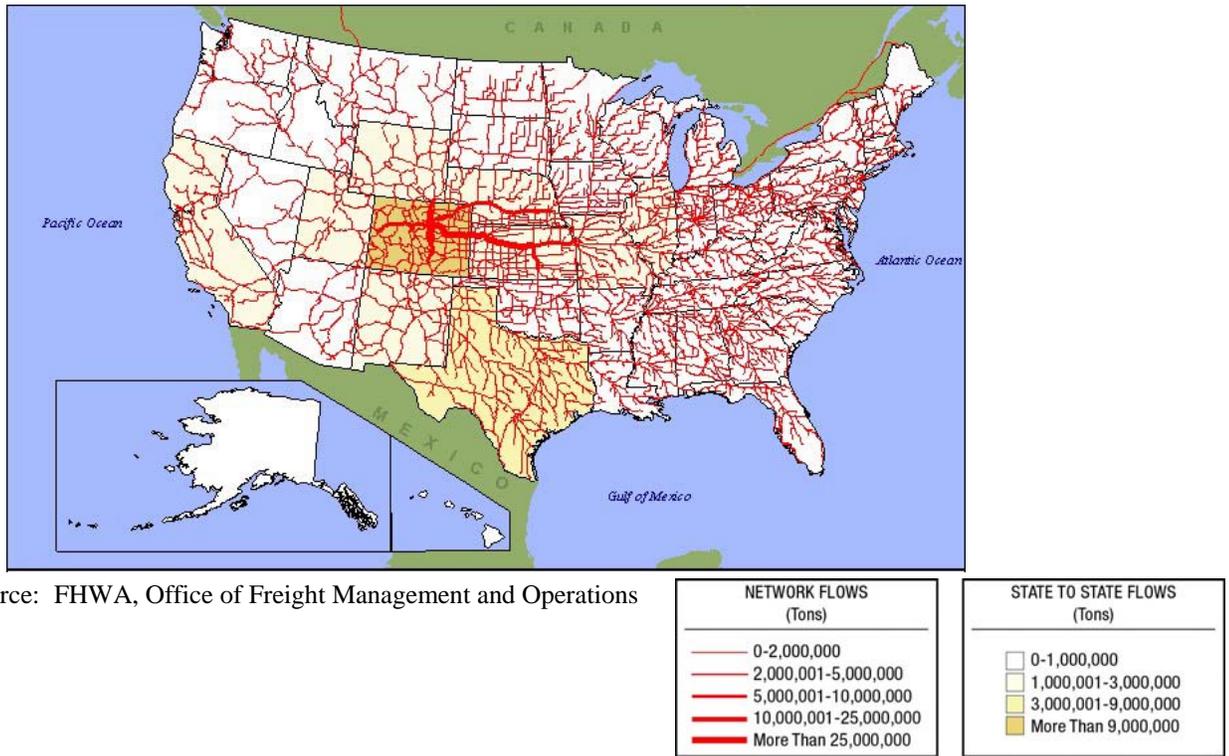


Figure 6. Colorado International Truck Flow (1998)

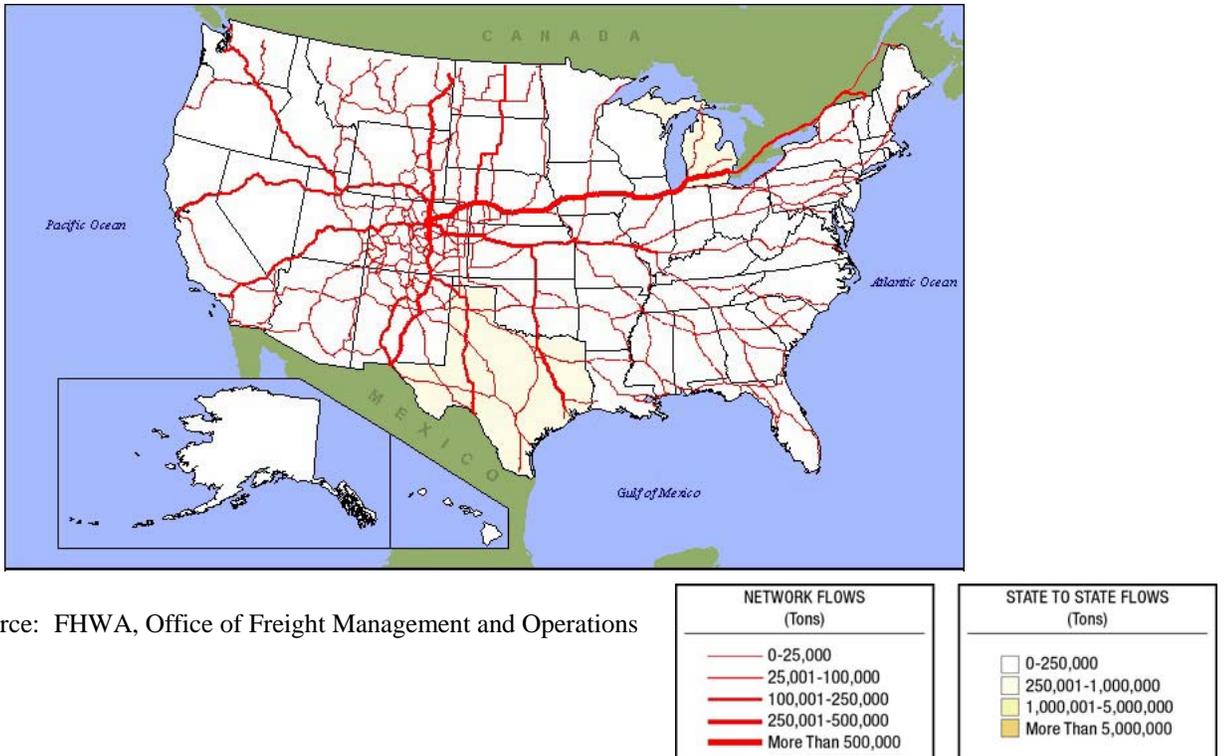
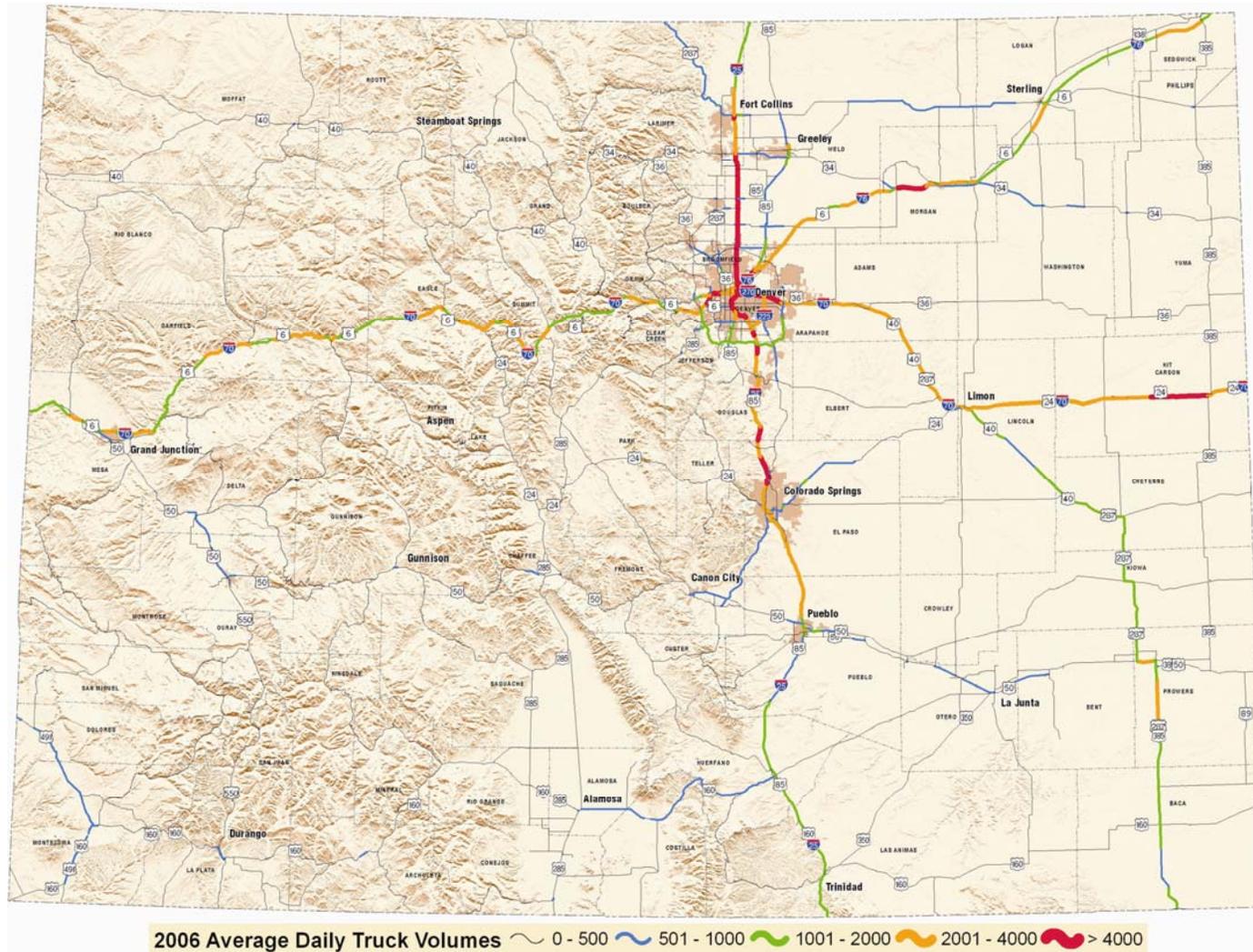


Figure 7. 2006 Average Daily Truck Volumes



Source: CDOT Transportation Planning Data Set

Figure 8. Colorado Rail Network

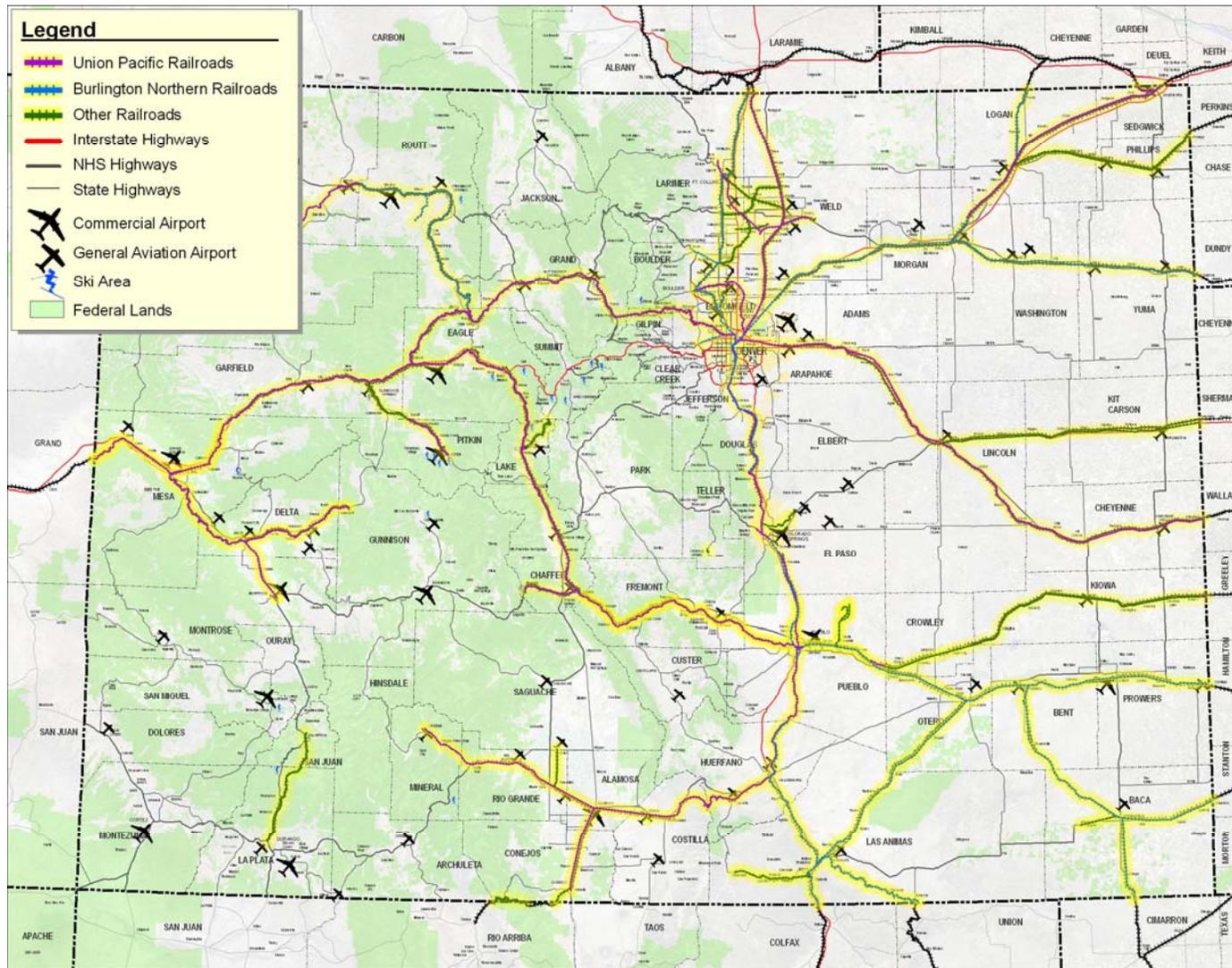
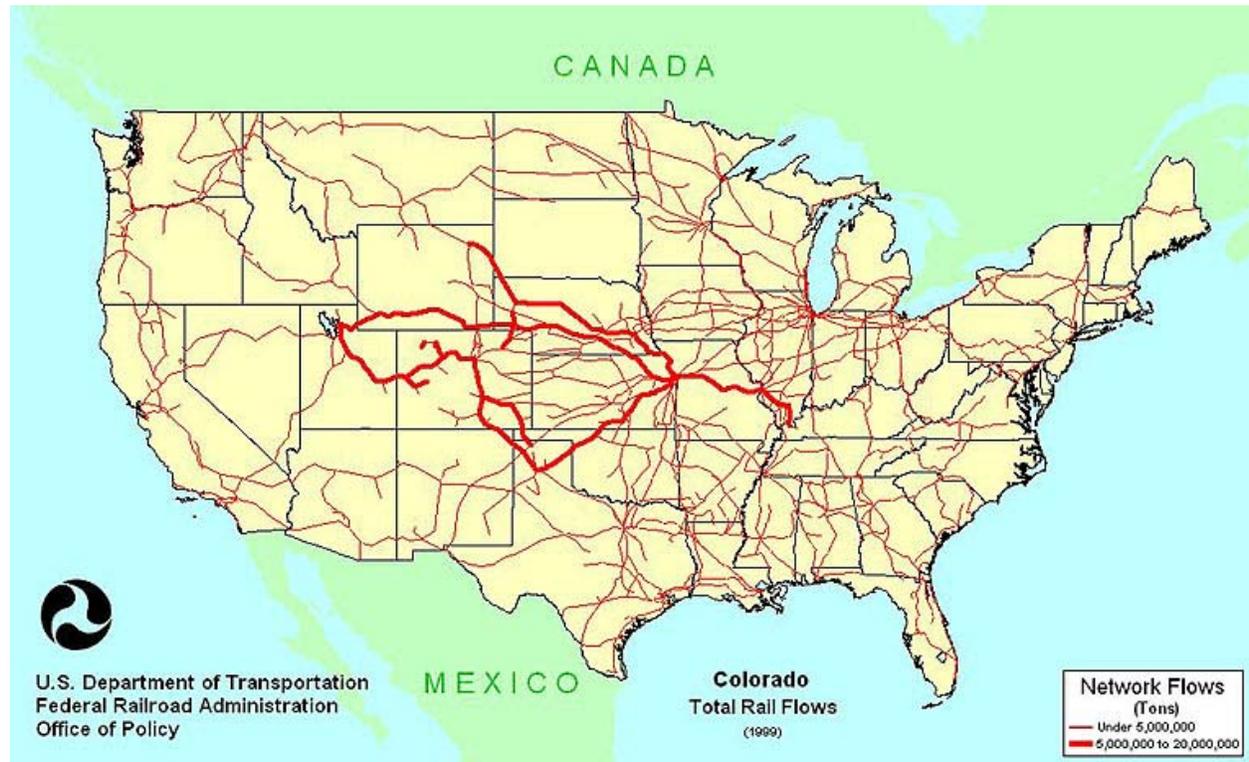


Figure 9 depicts the flow of freight by rail to and from Colorado. (Once again, this map reflects 1999 data, because the new map reflecting 2002 data has not yet been prepared by FHWA). As shown, the lines which have the greatest density of freight movement are the BNSF line along the I-25 corridor from Denver south to the New Mexico border, the BNSF line from Pueblo to the Oklahoma border via Baca, and the UP line west across the Continental Divide through the Moffat Tunnel and then along the I-70 corridor into Utah.

Figure 9. Colorado Rail Flows



Rail, by its very nature, tends to carry predominately bulk commodities. For example, approximately three-quarters of rail freight originating in Colorado in 2005 was coal. Similarly, nearly 50 percent of the rail freight volume coming into Colorado was related to the movement of coal. Other products transported significantly by rail include nonmetallic minerals, glass and stone products, lumber and wood products, food products, and farm products.

Pipelines

Pipelines are a primary means of transporting petroleum products in Colorado. There are nine companies presently registered with the Colorado Public Utilities Commission to operate as pipeline companies: BP America Production, Conoco Phillips Pipeline Company, Magellan Pipeline Company, Pacific Energy Partners, Rocky Mountain Pipeline System, Sinclair Pipeline Company, Suncor Energy Pipeline Company, Valero Logistics Operations, and WestTex 66 Pipeline Company. These nine pipeline companies transport intrastate materials in 299 miles of pipeline; they also operate about 1,887 miles of pipeline in Colorado which transport materials on an interstate basis.

The products in these pipelines flow into Colorado from Medicine Bow and Cheyenne, Wyoming; Scott City, Kansas; and Borger, Texas. Crude oil for Colorado's Suncor Energy refineries and refined petroleum products such as gas, jet fuel and diesel fuel are supplied through the pipelines. Pipelines for distribution internal to Colorado include one line that runs from Denver to Fountain and another line that runs from the Suncor Energy refinery to a terminal in Aurora which supplies Denver International Airport.

Aviation

Colorado airports serve an important and growing function in goods movement. The ability to ship cargo to and from airports in Colorado is important for on time delivery of time sensitive products and for regional economic development. The nature of air freight shipping dictates that, while volumes are much less than that shipped on other modes, the proportionate value is much greater. This characteristic is highlighted by the results of the *2002 Colorado Commodity Flow Survey* presented earlier in this report. These data indicate that, based on weight, only an insignificant amount of commodities is shipped by air; however, based on value, that share increases to 7.5 percent of the total.

The Colorado aviation system is extensive, including 75 public-use airports. Of these 75 airports, 14 are commercial-service airports (such as Denver International Airport and Colorado Springs Municipal Airport) and 61 are general-aviation airports. This system of airports serves a variety of transportation functions, one of which is air cargo. Although detailed air freight data are not currently maintained at most Colorado airports, air cargo shipments at Denver International Airport, one of the busiest airport in the nation, are projected to double in the coming decades. Recognizing the growing demand for air cargo service, the Division of Aeronautics will focus on compiling better freight data and utilizing those data in the planning process.

It should be noted that the Eastern Colorado Mobility Study recommended specific air cargo facility improvements at DIA, Front Range Airport and the Colorado Springs Municipal Airport to support air freight development in the region. Other airports across the state could benefit from similar improvements.

Intermodal Facilities

Intermodal facilities are those locations where freight can be transferred from one mode of transportation to another. In Colorado, these primarily facilitate the transfer between truck and rail and take on several forms. There are two major intermodal rail/truck freight facilities: 1) the Union Pacific operates a facility at 40th Avenue and York Street in Denver, and 2) the BNSF has a major transfer site at 53rd Place and Fox Street, also in the Denver metropolitan area. The UP is currently assessing the feasibility of developing a new major intermodal operation along its line in the Fort Lupton area north of Denver. If feasible, this relocation from the 40th/York site would free up the lands on which the existing facility is situated to support the RTD FasTracks program.

A very successful intermodal facility handling rail, truck and air cargo in one location has been developed in Alliance, Texas. This project is serving as a model for a similar development, referred to as the TRANSPORT project, in Aurora adjacent to the Front Range Airport, served by a UP line, and in close proximity to I-70. This project is in its early stages of planning and development.

With Colorado's economy heavily influenced by agriculture, a very common form of intermodal facility is the grain storage and loading facility. There are 69 such operations licensed in Colorado, scattered throughout the state but very heavily concentrated in the Eastern Plains.

Although not typically defined as an intermodal facility, truck terminals and distribution centers also generate concentrated volumes of freight-related traffic. A large number of distribution operations are located in Denver, Colorado Springs, Pueblo and Grand Junction, and others are spread throughout the state. These facilities, for ease of access, are mostly concentrated in or near Interstate highway corridors, such as I-25, I-70, I-225 and I-270.

Intermodal Connectors

National Highway System (NHS) Intermodal Connectors are public roads that connect major intermodal terminals to the highway network. These connectors are a critical component of Colorado's transportation system and provide important conduits for the timely movement of people, goods and services. Therefore, it is critical that they be maintained to a high standard.

Although these connectors are on state highways, county roads and city streets, their value to the transportation system justifies their inclusion on the National Highway System. In Colorado there are 31 designated intermodal connectors, and they connect to six different types of facilities: airport, Amtrak, rail/truck terminal, intercity bus terminal, public transit, and pipeline. **Table 1** provides a summary of the 31 connectors. As shown, the majority of these connectors are on city streets, with only 2 connectors designated on state highways. Further, the greatest number of connectors provide access to rail/truck terminals (9), to public transit (7) and to airports (5).

Table 1. NHS Intermodal Connectors

Type of Connector	State Highways	County Roads	City Streets	Total
Airport	1	2	2	5
Amtrak			3	3
Rail/Truck Terminal	1	6	2	9
Intercity Bus Terminal			4	4
Public Transit			7	7
Pipeline		1	2	3
Total	2	9	20	31

COLORADO FREIGHT-RELATED INITIATIVES

Recognizing the importance of a quality freight system to the economy of the state, Colorado has undertaken a number of initiatives in recent years to better plan, design and implement facilities for the movement of goods to, from, within and through the state. A few of these noteworthy initiatives are briefly described below.

Freight Advisory Council

The Freight Advisory Council (FAC) was created in 2003 as a resource to the Colorado Department of Transportation to assist in planning for freight in the state. The council is comprised of 12 members and approximately 50 participants from varying organizations, providers and users of the freight industry. As established, the primary role of the FAC is to serve as a forum for discussion regarding freight movement and freight infrastructure issues within Colorado. The FAC works with the State Transportation Advisory Committee to incorporate freight interests into the transportation planning process. It also serves to inform the public sector about the importance of freight infrastructure improvements and to enhance the statewide understanding of the key role of freight transportation to the economy of Colorado. The FAC has been actively involved in the statewide planning process, including development of the Statewide Transportation Plan.

High Priority Corridors Planning

The Transportation Equity Act of the 21st Century originally designated 43 high priority freight corridors in the United States for a focus on improvements to support the nation's commerce. Three such corridors were designated in Colorado: the Ports to Plains Corridor, the Heartland Express, and the Camino Real Corridor. Subsequently, additional corridors have been given "high priority" designation, including Colorado's fourth such corridor, the High Plains Corridor.

Ports to Plains Corridor

The Ports to Plains Corridor, on Colorado's Eastern Plains, begins in Laredo on the Texas/Mexico border and traverses through the Texas Panhandle, Oklahoma, New Mexico and Colorado, where it terminates at the junction of I-25 and I-70 in Denver. The corridor is nearly 1,400 miles long. This corridor is important not only for domestic trade, but also to support international trade which is expected to grow significantly through NAFTA.

The most recent effort in planning for this corridor was the completion of a *Corridor Development and Management Plan (CDMP)* in 2004, prepared as a joint effort of the Departments of Transportation of Colorado, Texas, New Mexico and Oklahoma. The CDMP outlines a series of priorities and steps to improve the corridor and serves as an essential tool for securing federal funding for corridor development. The plan includes the following construction elements:

- Widening 755 miles of 2-lanes roads to 4-lane divided roads
- Constructing 15 relief routes around larger towns
- Adding amenities needed by commercial vehicle operators
- Improving or constructing connective interchanges
- Improving or constructing overpasses for railroad crossings
- Replacing obsolete or deficient bridges
- Installing corridor-specific signs
- Integrating an intelligent transportation system (ITS).

The CDMP allows staged implementation of the construction elements, using a prioritization process and ongoing planning to fit projects into four priority groups. The total costs associated with this investment include both capital expenditures and the operations and maintenance expenses. The total cost of the project in 2004 dollars is nearly \$ 2.9 billion, with about \$ 610 million of those costs in Colorado.

In addition to the construction program, the CDMP also includes an extensive ITS Plan, which includes Traffic Management Projects, Commercial Vehicle Operations Projects, Emergency/Incident Management Projects, Traveler Information Systems Projects, and Maintenance and Construction Management System Projects.

Heartland Expressway Planning

The Heartland Expressway runs from Denver through Scottsbluff, Nebraska to Rapid City, South Dakota. Through the Eastern Colorado Mobility Study in 2002, a number of alternative routes for this designated corridor were explored and analyzed. After evaluation of that information, CDOT chose a combination of State Highway 71 and I-76 for official designation. The specific route includes I-76 from Denver to Brush and State Highway 71 from Brush to the Colorado/Nebraska border. The designation also includes State Highway 71 from Brush to Limon, as a corridor connector to the Ports to Plains Corridor. This designation now has official federal status. While the local entities continue to pursue improvements in this corridor, there have been no significant CDOT projects in the corridor in recent years.

Camino Real Corridor

The Camino Real Corridor runs from Mexico to Canada, via I-25 through Colorado. Because this route is the spine of the entire transportation network in Colorado, there have been considerable efforts expended over the years to ensure that this highway continues to be able to meet its demands in an efficient and safe manner. Major programs have been, or are being, undertaken to improve this corridor through Denver (TRES), Colorado Springs (COSMIX), Trinidad, Pueblo and Castle Rock. The North I-25 Environmental Impact Statement is currently addressing corridor needs from Denver to Fort Collins. These efforts collectively cover the majority of Camino Real through Colorado.

High Plains Corridor

The High Plains Corridor follows US 50 from Pueblo to Newton, Kansas. The Colorado Department of Transportation has completed a corridor study for the 150 miles in Colorado, and plans for improvements throughout this segment are continuing to be developed. These improvements include four-lane sections, passing lanes, other capacity improvements and safety enhancements.

Colorado Rail Relocation Implementation Study

As the Front Range has grown, there has been much discussion of the need to relocate through-freight train traffic away from the communities along the Front Range. In recent years, CDOT, the BNSF and the UP have been discussing the possibility of such a “bypass”. In 2002 the two railroads proposed a Front Range Railroad Infrastructure Rationalization Project, which would improve and relocate freight rail infrastructure, moving through-freight traffic and facilities east of the Front Range while still maintaining local freight service.

To assess this proposal, CDOT initiated a Public Benefits and Costs Study to identify the potential public benefits and the costs associated with the proposed project. The purpose of this study, published in 2005, was to determine whether the public benefits warranted consideration of public financial participation in the project. The study was designed to assess funding and financing options, to measure economic impacts, and to estimate construction costs. The results of the study indicated that, under any scenario studied, there would be more than sufficient benefit accruing to the citizens of Colorado to warrant the investment of public dollars in the proposed project.

Therefore, CDOT has initiated efforts to continue working toward implementation. The purpose of this effort, the Colorado Rail Relocation Implementation Study, is to determine what steps will have to be carried out to form a public/private partnership, to define and finalize the project scope and costs, to determine how costs should be shared based on both public and private benefits and related factors, to investigate what sources of funding are available, to determine how to finance the project, and to develop strategies for carrying out the necessary environmental clearances. This effort is expected to be completed within the next 1 ½ years.

National Freight Performance Measure Development

CDOT has been working with the Federal Highway Administration, Office of Freight Management and Operations over the past several years to help develop performance measures to be used by the FHWA as national-level measures of freight operations in the transportation system. It is hoped that, once perfected, these measures could also be used at the state and local levels in the planning process. The program currently centers on the development of travel time data which can be related to and monitored through achieved average speeds. The program is also exploring additional measures that focus on economic enhancement.

Freight Data Assessment

This study was undertaken by the Colorado Department of Transportation in 2005 to identify current and future freight data requirements for better planning, to assess the availability and the quality of such freight data, and to develop a framework plan to collect, maintain and make available needed freight data. In conjunction with the MPOs in the state and with other state and federal agencies involved in transportation planning in the state, CDOT identified the many ways in which freight data could be used and the relative importance of those data elements. Then the consultant team assessed all available sources of such information to determine how readily accessible the information would be to compile and how much reliability could be placed on the data. With this information, the priority list for data was adjusted and alternative freight data programs were outlined; these alternative programs were based on low funding, medium funding, high funding, and very high funding availability. A program requiring about \$750,000 over five years was recommended. This program includes the purchase of the statewide TRANSEARCH commodity flow database (which has been done), conduct of origin-destination studies, conduct of establishment surveys, several economic analyses, and additional vehicle classification counts on the state highway system. CDOT is continuing to pursue elements of this program.

Freight Data Synthesis

In the continuing program to effectively incorporate freight information into the transportation planning process, CDOT initiated a research project to provide a synthesis of the state-of-the-art practice for using freight data in the planning and modeling process at both the state level and the regional level. This research focused on such questions as:

- What have other state DOTs and MPOs done relative to freight data in their long range plans?
- Who are the leaders in this practice and what have they experienced?
- What models are available to use for incorporating freight into the planning process?
- What are the strengths and weaknesses of the various available data sources?

This synthesis has identified the most cost-effective approaches to be used in Colorado to incorporate freight flow into the transportation planning process and other activities.

Grant Applications – Truck Parking Initiative

A critical issue facing the state and the trucking industry is the lack of adequate off-road parking areas for long-distance trucks, resulting in truck drivers being forced to park on the side of the road or along interchange ramps, thereby creating hazardous situations that can also affect the capacity of the roads. CDOT recently prepared and submitted a grant application under Section 1305 of SAFETEA-LU to improve truck parking areas along critical routes on the state's highway network. The project would provide additional truck parking along I-70 west of Vail Pass. In addition to adding parking spaces, the project would improve access to the parking and would integrate ITS technology to provide greater information to truck drivers.