On time and under budget! Festivities were held in November 2006 as the Denver region saw the completion of the largest single congestion and mobility project in its history – T-REX, or the Transportation Expansion Project. Commuters, visitors, and business are now able to use light rail transit or new highway lanes to travel along the I-25 and I-225 corridors. The Colorado Department of Transportation (CDOT) and Regional Transportation District (RTD) worked cooperatively to get this major project completed in a highly efficient manner. It is a shining example for the rest of the country.

A lot of media attention has been given to describing congestion and comparing Southeast Corridor travel times (before and after, rail vs. car, rail vs. bus). Final conclusions on travel times, delay, and congestion cannot yet be reached due to holiday traffic patterns and December’s snowy weather, but benefits surely have been achieved. So what are the benefits of T-REX? This paper describes some of the initial benefits and discusses future analyses of benefits to be conducted by RTD.

Background

The need for rapid transit service and highway capacity improvements in the Southeast Corridor has been clearly noted in the regional transportation plans since 1983. The 1979 State Implementation Plan for air quality (carbon monoxide) also identified light rail along I-25 as a Transportation Control Measure to help reduce motor vehicle pollutant emissions. The completion date was set for 1987. However, funding for project was not obtained. The highway and light rail project was further solidified through a major investment study (MIS) completed in 1997. The Southeast Corridor MIS identified a light rail transit project along about 15 miles of I-25 from Broadway to Lincoln Avenue in Douglas County and 5 miles of I-225 from I-25 to Parker Road (SH-83). Recommendations for the highway included drainage, shoulder, interchange, and minor auxiliary lane improvements.

In 1999 funding was finally approved by local voters to construct the light rail transit line and by statewide voters to add new travel lanes to I-25 and I-225 along the entire length of the project. Shortly thereafter, the DRCOG Board approved the light rail line through the Senate Bill 208 approval process and an Environmental Impact Statement was completed in 2000. Construction on the newly named T-REX project began in 2001 amid newspaper headlines predicting “highway hell” for the next seven years.

Contrary to this prediction, the general consensus was that the construction impacts were relatively minor, especially when compared to other major national projects such as the I-15 project in Salt Lake City and the infamous Big Dig project in Boston. T-REX was completed by Southeast Corridor Constructors, a joint venture between Kiewit Construction and Parsons Transportation Group, within the original $1.67 billion budget and in less than six years rather than seven years. The project became a shining example across the country of an efficient and cooperatively managed major transportation project. CDOT, RTD, local governments, residents, and businesses worked closely together to enable the opening of the light rail transit and all new travel lanes by November 2006.
What Did T-REX Include?

Transit:

A 19-mile-long double-tracked light rail line was constructed starting at the existing I-25/Broadway station. Thirteen new rail stations were built, including over 7,500 motor vehicle parking spaces, 88 bicycle lockers, and racks to hold 90 bicycles. Pedestrian crossing bridges were provided at several stations, with one additional set to open over the next year. Four specific new rail routes (E, F, G, and H) were established to provide service parallel to I-225 and I-25 and connect to Lower Downtown (Denver Union Station) and Central Downtown (Stout Street and California Street).

Bus service operation changes were also made to coincide with the light rail line. Many bus routes were terminated at light rail stations to act as feeder routes. This has been the source of some concern from previous riders who traveled on a single vehicle to reach downtown Denver, but now are required to transfer to a train. RTD is evaluating the connections and transfer times for these trips. Another key bus service change was the provision of seven new call-n-Ride service areas.

Highway:

I-25 and I-225 were widened from their previous design. In general, one new through-lane and one auxiliary lane (between on-ramps and off-ramps) were added in each direction. For I-25 south of Belleview Avenue, two through-lanes were added in each direction. The complete interchange of I-25 and I-225 was reconstructed, as were six additional interchanges and several ramps connecting to arterial streets along the corridor. It should be noted that two adjacent complementary projects that were not a part of T-REX were also completed recently – the I-25 bridge over Broadway, and the Parker Road/I-225 interchange.

Management and Operations:

The T-REX Project partnered with businesses, DRCOG, and other transportation organizations to develop the TransOptions program. Through the T-REX Web site, special events, and outreach efforts, TransOptions supported or encouraged carpooling, vanpooling, transit, teleworking, walking and bicycling as means to reduce the impacts of the construction on the traveling public. The benefits of introducing people and businesses to these commuting options during the construction should extend well into the future.

Numerous intelligent transportation systems (ITS) devices and systems were installed during the T-REX construction to help manage traffic, respond to incidents, and provide real-time information to travelers. Closed-circuit television cameras, dynamic message signs, vehicle detection systems, and ramp meters were installed and are monitored and operated through the CDOT Traffic Management Center. ITS applications were also installed in conjunction with the light rail stations including parking facility use monitoring, bus and train arrival/departure information, and transit signal priority at exits from stations.
What Are the Impacts of T-REX?

The completion of the T-REX project has resulted in many impacts. Some are already evident and are discussed below. However, some impacts will not be known for some time. For example, a couple of years of data will be needed before determining the impact on the number and rate of traffic crashes (aka “accidents”). We’ll also need to account for extreme weather conditions that may have caused abnormalities in the number of crashes. It should be noted that for each of the questions and responses discussed below, additional information must be collected and analyzed before reaching final conclusions. It will take time for all of the freeways and arterials in the corridor area to “reach equilibrium” as travelers adjust their typical travel routes after becoming familiar with the travel time changes and new transit options.

Traffic Congestion and Travel Times

Within weeks after the opening of the new travel lanes on I-25 and I-225, the media began reporting on travel time and speed changes. Over the next year RTD and CDOT will be concluding a before and after study that thoroughly analyzes the changes in travel patterns due to T-REX. In the meantime, DRCOG has compiled initial field measurements and results from the Congestion Mitigation Program database to take a preliminary look at post-T-REX travel changes.

Has traffic congestion been eliminated? Not entirely. For the overall corridor, measures of congestion have improved and the Southeast light rail line has provided a new travel option to people living or working along the corridor. However, on average, I-25 and I-225 still carry nearly 200,000 and 120,000 vehicles respectively per day. With those volumes of traffic there is bound to be some congestion.

Does traffic congestion occur for a shorter period of time each day? Yes. One consideration for evaluating congestion is the length of time, or duration, of congested conditions on a typical day. Clearly, on average in the peak periods, congested conditions now begin a little later and end a little earlier.

Have average highway travel times been reduced? Yes, and this is directly related to average increased travel speed. Before and after travel times are presented in the table below. On average, it appears that the travel time for vehicles traveling the entire length of I-25 in the peak hour are 10 minutes less than before T-REX.

<table>
<thead>
<tr>
<th>Travel Time Estimates:</th>
<th>I-25 from Lincoln Avenue (Douglas County) to Broadway</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Off-Peak (Free-Flow)</strong></td>
</tr>
<tr>
<td></td>
<td>DRCOG</td>
</tr>
<tr>
<td>Before and After T-REX</td>
<td></td>
</tr>
<tr>
<td>Travel Time Before</td>
<td>15</td>
</tr>
<tr>
<td>Travel Time After</td>
<td>14</td>
</tr>
</tbody>
</table>
Someone traveling the entire length of the project will normally experience these results, but conditions will vary day by day. Short distance trips along specific portions of the corridor will not reap the entire benefits. For example, a driver who enters northbound I-25 from University Boulevard and travels through past Broadway may have minimal benefits.

**Where does the most severe and longest duration of congestion continue to occur?**

- Northbound I-25 approach to Broadway/Santa Fe: This is a key “bottleneck” location where the number of northbound through-lanes decreases from 4 to 3 lanes just prior to the Santa Fe Drive on-ramp;
- Off-ramps of some major interchanges: At certain time periods, the storage capacity of off-ramps is exceeded. It is important to prevent vehicles from queuing up back to the freeway. The timing of traffic signals at the off-ramp intersections will be monitored and adjusted to provide adequate green-light time to move the traffic through and reduce such back-ups; and
- Southbound I-225 approach to I-25: This is one of the busiest three-way freeway interchanges in the country. More than 50,000 vehicles per day travel from I-225 on to I-25. So even with the T-REX improvements, some congestion is bound to occur.

**Are more cars traveling on I-25 and I-225?** Over time it is very likely that traffic volumes will increase. This would be due to overall regional growth and shifting of travel paths. As motorists learn about the improved travel times on the freeways, the route for some trips may shift from parallel side streets (e.g. Quebec Street and University Boulevard). This could provide benefits to those streets. Because of the extreme winter weather conditions and short time since T-REX was completed, conclusive results are not yet available. The RTD before-and-after study referenced earlier will provide results later in the year.

**Are more people riding in transit vehicles?** Preliminary data indicate that overall transit ridership has increased substantially in the Southeast Corridor.

**Free-Flow Travel Speeds**

Following the widening of I-25 south of I-225, the posted speed limit was raised from 55 mph to 65 mph. This factor alone would decrease legal travel times on I-25 through the Denver Tech Center area by at least 5 minutes. Though increases in speed limits are generally implemented in response to existing free-flow travel speeds, some increase in overall average travel speeds may occur. Monitoring of conditions and speeds by CDOT, the Colorado State Patrol, and local law enforcement agencies will continue. Through enforcement and other efforts, unsafe travel speeds can be discouraged.

**Transit Trip Times**

Transit along the Southeast Corridor light rail line has offered lower travel times to most, but not all transit users. It offers better reliability and a significant increase in vehicle capacity to handle a higher number of riders. RTD is still working out some of the technical and operational kinks, just as with any new product or service. Some commuters that previously used bus routes that traveled directly to downtown Denver have faced longer commute time because of required transfers onto the light rail line. Adjustments to the bus routes may be considered by RTD to respond to concerns from large markets of riders.

In many typical instances, door-to-door travel times are comparatively longer via transit than driving a car. But commuters consider many other factors in deciding how to travel. Parking and fuel costs, vehicle wear and tear, stress, reliability, trip requirements, and weather conditions are
among many of the factors considered. Periodic incidents related to weather, crashes, construction, and lane closures will greatly increase travel times on the highway with minimal impact on light rail. Mechanical failures on light rail tracks and vehicles do occur, but much less frequently than highway incidents. Thus, there is no definitive answer for determining the better mode of travel.

Conclusion

Time will tell the entire story of the impacts of T-REX. The following factors will influence the story, but may not be evident for several months or even years:

- Drivers adjusting travel routes;
- Travelers switching travel modes (transit, carpooling, etc.);
- Entirely new trips or longer trips being made because of decreased travel time and improved transit service;
- Price and supply of gasoline;
- Popularity of existing housing near transit stations to different demographic populations;
- Construction of new housing units near transit stations;
- Maturing of transit oriented developments (TODs) at transit stations;
- Business and personal cultural shifts that encourage teleworking; and
- Overall economic and population growth in the corridor, region, and state.

To learn more about T-REX, Southeast Corridor light rail, and day-to-day travel information and travel options in the Southeast Corridor visit the following Web sites:

- T-REX: www.trexproject.com
- RTD: www.rtd-denver.com
- CDOT traveler information (cameras, message signs, travel times, etc.): www.cotrip.org
- DRCOG RideArrangers (carpool, vanpool, telework, travel options): www.drcog.org
- Southeast Business Partnership (travel options and assistance): www.sebp.org