

5.1 INTRODUCTION

Purpose and Scope

A financing strategy for the Preferred Alternative identified through the National Environmental Policy Act of 1969 (NEPA) process is required prior to the signing of the Record of Decision (ROD). As a condition of the ROD, the Preferred Alternative, or a phase of the Preferred Alternative, must also be included in the fiscally-constrained, long-range regional and statewide transportation plans. Fiscal constraint implies that there is a reasonable expectation that funding will be available to implement the projects and activities identified in the plan.

Since there are insufficient funds to construct any one of the build packages for the United States Highway 36 (US 36) corridor in their entirety, the project selected in the ROD is a logical phase of the Preferred Alternative that demonstrates independent utility. With a ROD to be issued after the Final Environmental Impact Statement (FEIS) public hearing and comment period, the Colorado Department of Transportation (CDOT) and the Federal Highway Administration (FHWA) will select an initial phase (Phase 1). The Phase 1 package will be fiscally-constrained (i.e., it will have a probable cost equal to or less than the amount in the Regional Transportation Plan). As additional funding becomes available, the Regional Transportation Plan will be amended and CDOT/FHWA will issue ROD(s) to implement subsequent phases, working toward implementation of the Preferred Alternative in its entirety.

The availability of transportation funding is increasingly problematic for communities across the country. New funding strategies for transportation are being discussed at the national, state, and local levels. Traditional funding mechanisms no longer provide the level of funding required to maintain the existing transportation system or build the new projects being planned to meet increasing demands. The United States Congress is currently debating the issue, as is the State of Colorado.

State and federal transportation funding has been relatively stagnant over the last several years, while construction costs have escalated substantially. The cost for construction increased approximately 40 percent between 2002 and 2006. Since 2006, construction and labor costs have decreased somewhat. Maintenance costs are also increasing, taking a larger portion of the transportation dollar to preserve the existing infrastructure.

Traditional sources of transportation funding for highways have depended upon taxes on gasoline and other motor fuels. Nationally, it has been estimated by United States Department of Transportation that the purchasing power of the gas tax is about one-third less than it was in the 1960s. In Colorado, the Highway Users Trust Fund (HUTF) is worth only about 30 percent of its original 1992 value, the last time gas taxes were increased.

In Colorado, the HUTF provides approximately 40 percent of state funds for highway improvements. General fund revenues may also be available from year to year to supplement transportation funding. Federal funds are apportioned to the state and some discretionary funding from federal sources is obtained by CDOT for specific projects. In 2008, federal funds made up approximately 30 percent of the state's transportation budget.

Managed lanes vary from general-purpose lanes because they typically incorporate a pricing mechanism to manage congestion, thus ensuring long-term travel time reliability in the corridor for transit vehicles, high-occupancy vehicles (HOVs), and toll paying single-occupant vehicles (SOVs). The collection of tolls generates a revenue stream that can be used to cover the annual operations and maintenance (O&M) costs, and/or a portion of construction costs. Package 2 and the Combined Alternative Package (Preferred Alternative) both include managed lanes in each direction along the entire length of the project corridor.

Traditional sources of transit funding come from federal funding, regional sales taxes, and farebox revenues from patrons. Federal funds, including a mix of federal gas tax and general fund moneys, are provided to transit agencies on a formula basis for rolling stock and some operating expenses. The Federal Transit Administration New Starts and Small Starts program provides discretionary funds for capital projects on a merit basis.

In the Denver metropolitan area, transit funds are generated by sales taxes in the six-county Regional Transportation District (RTD). In 2004, voters approved the FasTracks Program to increase sales taxes dedicated to RTD transit from 0.6 percent to a full 1 percent to build six new rail lines, extend existing lines, and construct bus rapid transit (BRT) stations along US 36 (only a portion of the cost to construct the BRT lanes is included in FasTracks).

The information provided in this document reflects the funding sources presently available. Future revenue sources could come from both highway and transit programs and would need to be programmed through the traditional Denver Regional Council of Governments (DRCOG) planning process.

The financial analysis is preliminary and conceptual in nature because both the costs and revenues are based on order-of-magnitude estimates prepared using planning-level data. These limitations notwithstanding, the figures are useful in identifying aggregate needs and funding available from existing sources, and determining remaining funding shortfalls. They are also an excellent tool to compare costs among the alternatives under consideration.

This chapter presents the results of a preliminary analysis of funding requirements and potential funding sources. The analysis contains the following elements:

- Capital and projected O&M cost estimates for the build packages.
- Available or planned funding sources, including projects in the *2035 Metro Vision Regional Transportation Plan (2035 MVRTP)*, as amended (*Fiscally-constrained Element*) (DRCOG 2009), and anticipated revenue from the managed toll lanes and bus fare box revenue.
- Estimated funding shortfall.

5.2 CAPITAL COST ESTIMATES

Cost estimates were prepared for each of the build packages using engineering design review plans.

A standard format for cost estimates was obtained from CDOT and RTD for all elements including highway and interchange components, BRT facilities, transit stations, and park-n-Ride lots. Allowances were used for items such as drainage, signing/striping, construction traffic control, preliminary and final engineering, and construction services (management, administration, and engineering).

Estimated Costs of Packages

Estimated costs, including both pre-construction activities and construction items, have been developed for each of the three build packages. Concept-level cost estimates were made initially for comparison of the build packages. As more detail was developed about the packages and key elements, the design work was refined as well as the cost estimates.

Refinement of the cost estimates was possible as more became known about the packages. Information and comments received during public and agency review of the Draft Environmental Impact Statement led to the Combined Alternative Package (Preferred Alternative). Key elements, such as using side loading BRT stations instead of median stations and the layout and conceptual design of the managed lanes, helped to reduce the footprint of the Combined Alternative Package (Preferred Alternative) and related costs.

Development of a phasing plan to match expected funding availability also defines the timing of expected costs. Phasing assumptions were used for cost-estimating purposes to reflect logical phases of the project that would have independent utility and that could be completed over time as funding becomes available.

Initial estimates of total costs for the build packages in 2008 dollars were \$2.435 billion for Package 2, \$2.126 billion for Package 4, and \$1.874 billion for the Combined Alternative Package (Preferred Alternative). Subsequent planning and design work refined these costs to develop the costs shown in Table 5.2-1, Project Cost by Package and Component.

Table 5.2-1: Project Cost by Package and Component

Component	Package 2 ¹	Package 4 ¹	Combined Alternative Package (Preferred Alternative) ¹
Highway Lanes	\$876	\$752	\$657
Interchanges	\$456	\$392	\$384
BRT Stations	\$210	\$213	\$55
Bikeway	\$19	\$19	\$19
Right-of-Way	\$220	\$200	\$160
Cost Expended to Date	\$21	\$21	\$21
Total Project Cost²	\$1,802	\$1,597	\$1,296

Source: FHWA, 2009; US 36 Mobility Partnership, 2009.

Notes:

¹Values are in 2008 dollars – millions of dollars

²Implementation of BRT service in the corridor would also require expenditure of an additional \$56 million for BRT vehicles, which would be purchased using local transit funds. This would apply to all the build packages.

BRT = bus rapid transit

Cost Estimate Review

In addition to the standard cost estimate described above, a Cost Estimate Review (CER) was conducted on the Combined Alternative Package (Preferred Alternative) by CDOT and RTD with guidance from FHWA. The CER is required by FHWA for projects that are predicted to cost more than \$500 million. The CER examines assumptions used to prepare the estimates and provides a focus to refine and validate the estimating process and results. The basis of the CER is the CDOT cost estimate.

The CER identified a number of areas where both unit costs and percentage cost allowances could be refined. With the assumed phasing plan, CDOT would experience savings because of the large size of each phase. Elements such as construction traffic control and project contingencies were reduced to reflect the scale of the project and the expected conditions. The right-of-way for the project was also examined in more detail and overall costs reduced. Finally, key unit prices for elements, such as earthwork and pavement, were reduced based on CDOT’s experience with similar projects.

The FHWA review and validation process provides an estimate range for each element and then aggregates the elements to provide an overall estimate at different probability levels. The process estimates 70 percent probability, meaning the project would have at least a 70 percent chance of being constructed for that cost. Typically, the 70 percent cost is used as a reasonable probable cost for a project.

If there are multiple construction contracts, FHWA also requires that the cost of the project be expressed in year of expenditure dollars. This is done by assigning an inflation rate per year to the proposed mid-point of construction. For Phase 1, the mid-point of the construction contract is selected for the year of analysis for each construction project based on the 2035 MVRTP, as amended (DRCOG 2009). For future phases, such as Phases 2 and 3, where the specific construction projects and funding have not been determined, the mid-point of future 20-year plans was used to estimate the mid-point (2047 for Phase 2 and 2072 for Phase 3). The year of expenditure cost estimates were developed assuming a most likely inflation rate of 3.8 percent, with a best-case of 3.0 percent and worst-case of 4.6 percent. This range of escalation rates was applied to the time period from the 2008 base estimate to the mid-point of construction for each phase. The year of expenditure cost is high in comparison to the 2008 year costs because the funding is anticipated to occur over a long time period. Year of expenditure estimates assume completion of Phase 1 in 2035, and completion of the balance of the Combined Alternative Package (Preferred Alternative) in 2085. Reporting the costs in year of expenditure dollars is anticipated to greatly reduce the media and public perception of cost growth.

The cost estimates developed using standard cost estimating, CER probabilistic estimating, and CER probabilistic year of expenditure estimating are shown in Table 5.2-2, Standard, Probabilistic, and Year of Expenditure Costs.

Table 5.2-2: Standard, Probabilistic, and Year of Expenditure Costs

	Standard Cost Estimate (2008 dollars, millions)	CER Cost Estimate (2008 dollars, millions)	Year of Expenditure Cost Estimate (millions of dollars)
Combined Alternative Package (Preferred Alternative)	\$1,296.0	\$1,336.7	\$6,572.0
Phase 1	\$536.0	\$ 552.7	\$999.1

Source: US 36 Mobility Partnership, 2009.

Notes:

CER = Cost Estimate Review

For comparison purposes, the FEIS considered what the cost would be to simply upgrade the outdated US 36 highway. Originally constructed in the early 1950s, much of US 36 consists of elements with more than 50 years of service. Even if no new capacity was added, many elements of the highway would need to be reconstructed in the next 20 to 30 years because of age. It would cost an estimated \$441 million in 2008 dollars just to make the necessary improvements to bring the highway up to current standards. These improvements are included in each of the build packages described above.

5.3 AVAILABLE OR PLANNED FUNDING

This section provides an estimate of funding currently included in the 2035 MVRTP, as amended, (*Fiscally-constrained Element*) (DRCOG 2009) for US 36 corridor improvements. The plan lists the specific projects for which there is a reasonable expectation that funding will be available to implement.

Table 5.3-1, US 36 Projects in 2035 Fiscally Constrained Regional Transportation Plan, lists these projects and summarizes the estimated costs at the time the plan was developed.

Table 5.3-1: US 36 Projects in 2035 Fiscally Constrained Regional Transportation Plan

Category	US 36 Corridor Project	Cost Estimate ¹
Regional Roadway System: Current Projects Identified in the 2008-2013 TIP/STIP	Reconstruct interchange at McCaslin Boulevard	\$9.2
Regional Roadway System: Other Future Improvements Eligible for Future TIP Funds	Reconstruct interchange at Sheridan Boulevard	\$54.0
	Reconstruct interchange at Wadsworth Parkway	\$153.5
Regional Roadway System: Other Roadway Projects (Includes \$187.4 Million from FasTracks)	Add managed BRT/HOV lanes: Foothills Parkway to I-25	\$486.4
Other ²	US 36 bikeway	\$8.0
Total		\$711.1

Source: DRCOG, 2008; RTD, 2008 and 2009.

Notes:

¹Values are in 2008 dollars – millions of dollars.

²Reasonably expected” by DRCOG but not listed as a specific project in the 2035 Metro Vision Regional Transportation Plan, as amended (2009).

The cost estimates provided in this table are the officially adopted values approved by the Denver Regional Council of Governments.

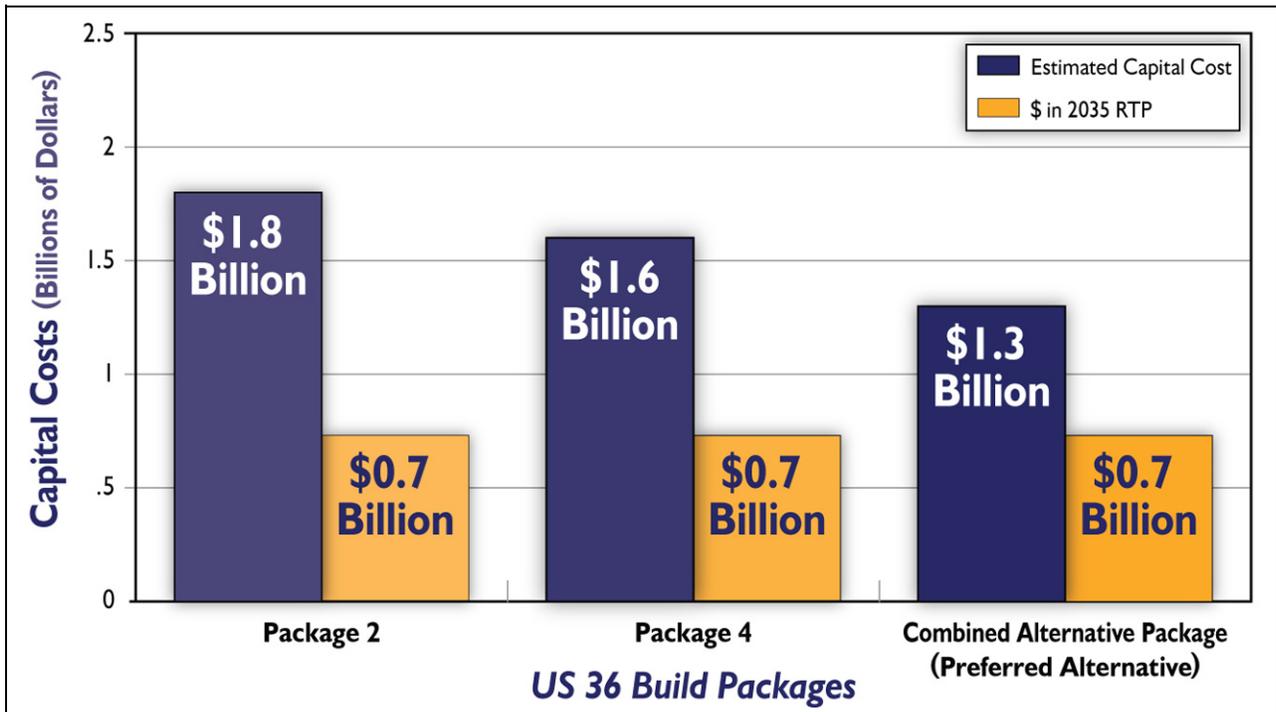
- BRT = bus rapid transit
- HOV = high-occupancy vehicle
- I-25 = Interstate 25
- STIP = State Transportation Improvement Program
- TIP = Transportation Improvement Program
- US 36 = United States Highway 36

5.4 ESTIMATED FUNDING SHORTFALL

The estimated capital costs for each of the build packages exceeds the currently available or planned funding contained in the 2035 MVRTP, as amended (DRCOG 2009), for the US 36 corridor.

Figure 5.4-1, Estimated Capital Cost Funding Shortfall, illustrates this funding gap. The funding shortfall for the Combined Alternative Package (Preferred Alternative) is \$600 million. As mentioned previously, the toll managed lanes offer a unique funding mechanism that can assist in financing the project by providing additional revenue beyond the 2035 MVRTP, as amended (DRCOG 2009). However, even after accounting for the toll revenue, funding shortfalls are still anticipated.

Figure 5.4-1: Estimated Capital Cost Funding Shortfall



Source: US 36 Mobility Partnership, 2009.

It is important to note that both the construction costs and the 2035 MVRTP, as amended (DRCOG 2009), funding numbers are in 2008 dollars. Since there are insufficient funds to construct the Combined Alternative Package (Preferred Alternative) in its entirety, the project will be broken into logical phases or projects that can demonstrate independent utility. Independent utility means that the project would be useful and reasonable even if no other improvements were made.

5.5 ESTIMATED OPERATIONS AND MAINTENANCE COSTS

Annual O&M costs must also be considered. Both transit and roadway O&M costs were developed for all of the build packages. Operating costs for the build packages are important because of their differences; Package 2 and the Combined Alternative Package (Preferred Alternative) have unique operating costs related to the managed lanes.

Annual Highway Operations and Maintenance Costs

Costs to operate and maintain the highway improvements must be considered in evaluating project alternatives. The highway lanes would need to be operated and maintained according to CDOT policies and procedures. Historic cost experience in CDOT Region 6 shows an average maintenance cost of about \$8,000 per lane mile. The additional width of multiple lanes and shoulders, as well as the separated nature of the highway lanes in the build packages, may require increases in the per lane maintenance costs not included in these estimates.

Table 5.5-1, Annual Highway Operations and Maintenance Cost Estimates by Package, summarizes the cost estimates.

Table 5.5-1: Annual Highway Operations and Maintenance Cost Estimates by Package

Operations and Maintenance Component	Unit	Package 1 ¹	Package 2 ¹	Package 4 ¹	Combined Alternative Package (Preferred Alternative) ¹
General-Purpose Lanes/ Auxiliary Lanes	Package 1 – 78 lane miles Package 2 – 78 lane miles Package 4 – 114 lane miles Combined Alternative Package (Preferred Alternative) – 110 lane miles	\$624	\$624	\$912	\$880
Special Lanes (Managed Lanes/BRT in Package 2 and the Combined Alternative Package (Preferred Alternative), BRT/HOV in Package 4)	Package 1 – 8 lane miles Package 2 – 72 lane miles Package 4 – 36 lane miles Combined Alternative Package (Preferred Alternative) – 33 lane miles	\$64	\$576	\$288	\$264
Highway Patrol and Roadside Assistance	Lump sum (\$20,000 per centerline mile)	\$360	\$360	\$360	\$360
Total Estimated Annual Operations and Maintenance Cost	N/A	\$1,048	\$1,560	\$1,560	\$1,504

Source: US 36 Mobility Partnership, 2009; CDOT/CTE, 2009.

Notes:

¹Values are in thousands of dollars.

BRT = bus rapid transit

HOV = high-occupancy vehicle

N/A = not applicable

Highway Operations and Maintenance Costs Over 50-Year Lifespan

For any of the three build alternative packages under consideration, O&M costs would continue for the life of the facilities. The existing US 36 highway has operated for more than 50 years, a time period typically used for the service life of a major capital improvement.

Considering the accumulated expenses for O&M over a 50-year period, the following totals were calculated for comparison using an average increase in costs of 4 percent per year. Costs for O&M presented here include only the highway O&M activities. Because revenue would be generated by the managed lanes, those annual amounts were assumed to offset the managed lane O&M costs for those packages. Managed lane O&M costs are presented separately below.

- Package 1 O&M – \$160 million
- Package 2 O&M – \$238 million
- Package 4 O&M – \$235 million
- Combined Alternative Package (Preferred Alternative) O&M – \$230 million

Each of the build packages assumes that all O&M costs associated with maintaining the highway lanes will be incorporated into the CDOT annual maintenance budget. As described earlier in this chapter, traditional funding sources are not keeping pace with the cost to maintain the state highway network. If costs continue to increase while the purchasing power of the revenue stream decreases, there is the potential for reduced maintenance and operation activities, resulting in less than desirable driving surface, longer delays for snow removal, and more frequent lane closures for maintenance operations as the road ages.

Toll Equipment and Managed Lane Operations and Maintenance Costs

For Package 2 and the Combined Alternative Package (Preferred Alternative), the project costs must also include the cost to purchase tolling equipment and operate and maintain the associated tolling functions. The total estimated annual O&M and debt service costs for Package 2 and the Combined Alternative Package (Preferred Alternative) are presented in Table 5.5-2, Capital and Annual Operations and Maintenance Cost Estimated for Toll Equipment. Several assumptions were made to prepare these cost estimates:

- The managed lanes in Package 2 and the Combined Alternative Package (Preferred Alternative) would be operated by the Colorado Tolling Enterprise (CTE) recently reformed and renamed the High Performance Transportation Enterprise (HPTE), the successor entity to the CTE or a similar organization.
- The HPTE could use the existing E-470 system as a contractor to administer the transactions as they do currently for the north Interstate 25 (I-25) express lanes.

Table 5.5-2: Capital and Annual Operations and Maintenance Cost Estimates for Toll Equipment

Managed/Toll Lane Component	Package 2 ¹	Combined Alternative Package (Preferred Alternative) ¹
Number of Transaction Sites	12	14
Capital Costs for Tolling Equipment	\$15.9	\$18.5
Annual Debt Service on Capital Equipment (20 Years at 6%)	\$1.4	\$1.6
Managed Lane Operations and Toll Equipment Maintenance (\$100,000 per Site)	\$1.2	\$1.4
Toll Violation Enforcement	\$0.2	\$0.2
Subtotal	\$2.8	\$3.2
Contingency (5%)	\$0.2	\$0.2
Total Estimated Annual O&M Costs	\$3.0	\$3.4

Source: CTE, 2009.

Notes:

¹Values are in millions of dollars.

A 5 percent contingency was added to all costs.

% = percent

O&M = operations and maintenance

Package 2 is assumed to have six toll collection sites each direction for a total of 12. The Combined Alternative Package (Preferred Alternative) is assumed to have seven toll collection sites each direction for a total of 14.

The estimated capital cost for tolling equipment on the corridor is \$15.9 million for Package 2 and \$18.5 million for the Combined Alternative Package (Preferred Alternative). Included in that estimate are the cost for sign bridges, variable message signs, fiber, cameras, tag readers, and lane controllers. The estimate relies on assumptions and equipment needs outlined for an Urban Partnership Agreement proposal submitted in 2008.

- Enforcement costs of \$150,000 per year are estimated for the managed lanes (projected from actual per mile cost of enforcement on I-25 express lanes).
- For each toll transaction site (overhead gantry or similar), \$100,000 per year for operations such as toll collection, toll equipment maintenance, and processing (projected based on actual I-25 express lane contract with E-470 for the same services which involves 4 toll collection sites at \$100,000 per year cost for each site).
- Capital tolling equipment would be purchased upfront utilizing a loan from CDOT. The loan would be repaid over 20 years at a 6 percent interest rate resulting in an annual debt service payment of \$1.4 million for Package 2 and \$1.6 million for the Combined Alternative Package (Preferred Alternative).

Total annual costs for toll equipment and managed lane O&M are estimated to be \$3.0 million for Package 2 and \$3.4 million for the Combined Alternative Package (Preferred Alternative). As described below, it is expected that those costs would be fully offset by toll revenues collected.

Managed Lane Revenue

Package 2 and the Combined Alternative Package (Preferred Alternative) present the opportunity for revenue generation through tolling as well as providing an opportunity for substantial travel time savings within the managed lanes (for more information on operational impacts, see Chapter 3, Transportation Impacts and Mitigation).

Toll collection from the managed lanes would generate a revenue stream that could be used toward operating and maintaining the tolling equipment, bonding and, to the extent that there is excess, some portion of the capital construction costs. At this time, toll revenues are proposed only to cover the annual

costs of purchasing, operating, and maintaining the toll-related equipment and operations. Beyond that, excess toll revenue, if it occurs, could be used for other programs such as long-term Travel Demand Management (TDM).

The long-term assumption for this facility is that toll revenues collected would fully cover all capital equipment, operating, and maintenance costs for the tolling operation. The financial viability of this proposal then relies upon the ability of the system to collect sufficient toll revenue to cover (1) the acquisition and deployment of tolling equipment and (2) the annual O&M and enforcement costs.

Upfront funding for the toll equipment and ongoing O&M costs outlined above would likely come from some combination of:

- Toll revenues generated on the facility
- HPTE cash
- Upfront loan from CDOT to be repaid over time

For the Combined Alternative Package (Preferred Alternative), the current plan would be to implement the managed lanes over an extended period of time, using the revenues generated by the earliest operating segments to repay loans and to cover ongoing costs. However, this analysis presents the worst case scenario in which the HPTE would procure all the capital equipment in a single purchase of \$18.5 million, and also pay its share of the operating expenses for the managed lanes, including maintenance of the tolling equipment from day one. This analysis assumes that HPTE would pay for the toll equipment utilizing a 20-year loan from the CDOT Transportation Commission at 6 percent interest (annual loan payment of \$1.6 million).

This worst case scenario was analyzed because at this time it is not possible to determine the actual timing of when various segments would open and the revenue amounts that individual segments would generate.

For the Combined Alternative Package (Preferred Alternative), these assumptions indicate that the managed lanes would need to generate approximately \$3.4 million per year to cover O&M costs. The *US 36 Managed Lanes: A Managed Toll Lane Proposal* (CTE 2009) submitted to DRCOG in compliance with House Bill 05-1148 provides an analysis of the financial feasibility for this project. Travel model results from the NEPA process were used along with current traffic data and project assumptions to answer the following three questions:

1. How many toll-paying SOVs would be required to generate the \$3.4 million per year?
2. Would there be enough excess capacity projected in the managed lane to allow the required number of toll-paying SOVs?
3. Is it likely that the required number of toll-SOV trips would be attracted to the managed lane?

The reasonableness of the analyses was tested using three different methods and then compared to actual toll volumes on the existing I-25 express lanes. All three methods were found to support a conclusion that the facility could generate enough revenue to cover costs of the project. The Colorado Tolling Enterprise 2009 report provides this detailed analysis.

The tolled managed lanes presented in Package 2 and the Combined Alternative Package (Preferred Alternative) provide long-term reliability in that the pricing mechanism allows CDOT to manage the level of congestion in the managed lanes. By managing the level of congestion in the lanes, the travel time within the managed lanes can be kept at a consistent speed well above the adjacent congested general-purpose lanes. If congestion increases to the point that travel time is reduced, tolls can be raised to effectively reduce demand, easing congestion in those lanes, and again providing a reliable travel time in the managed lanes. This adaptive toll approach can sustain the effectiveness of this package well beyond the 20-year traffic projections used in this analysis.

Bus Operating Costs

Bus operating costs were developed by first determining the daily revenue hours of service for each route in each package. Once the hours of revenue service were calculated, operating costs per hour by service type (e.g., regional, express, local, etc.) were multiplied by the daily hours of revenue service. An annualization factor was then applied to determine the annual operating cost by service type. Annual bus operating costs were estimated at \$48 million for Package 1. Package 2 and Package 4 would increase annual operating costs by approximately \$20 million for each package. Estimated operating costs for the Combined Alternative Package (Preferred Alternative) are \$61 million, or a \$13 million increase over Package 1.

Projected Transit Revenue

Transit fare box revenue could be used to off-set the annual O&M costs for bus operations. RTD does not directly apply fare box revenue received to each corridor operations; however, some amount of fare box revenue would likely be used to off-set the annual O&M costs. Fare box revenues make up approximately 15 to 20 percent of RTD's annual budget. District sales tax and other sources cover the balance of operating costs for the RTD system.

