

**Ensuring Feasibility and Implementation:**  
**Modification of Criteria for I-70 Mountain Corridor**

**Final PEIS**

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Public roads, like any common property resource, can be subject to overuse. The overuse of scarce common property leads to degradation of that resource for all and to dynamic inefficiency. For those reasons congestion on public roads, the economic burden it imposes, and what to do about it are major concerns in many urban centers across the U.S. (Weisbrod 7). A review of many national congestion studies shows that the value of nonbusiness travel time is roughly 55% to 65% of a person's salary (Weisbrod 15). Nonbusiness travel time includes any trips not made on behalf of a company or employer, including driving to and from work, and personal and other trips. When congestion lengthens travel time the cost of the trip increases, imposing an extra burden on travelers. While this may not equate to large losses per person, when aggregated across a metropolitan area, during rush hour for example, the total loss to congestion deserves consideration. Yet economic centers across the U.S. have struggled with implementing solutions to this problem.

The Denver Metro area is no exception to this predicament, and the Colorado Department of Transportation (CDOT) has conducted numerous studies on the impacts of congestion and feasibility of solutions. The Colorado Tolling Enterprise (CTE), a subsidiary of CDOT, released a report in 2004 regarding the preliminary possibility and

feasibility of different road expansions and tolling systems on five major corridors: I-25, U.S. 36, I-225, C-470, and I-70 (CTE 1-1 - 1-7). While some of these large corridors have undergone major improvements in recent years (such as the I-25 "T-Rex" project), major projects for the I-70 mountain corridor are still in the early assessment and comment process.

Alternative project planning for the I-70 mountain corridor was under way by 1998 with the completion of the "I-70 Corridor Major Investment Study," and initial screening of alternatives was completed by 2001 (USDOT 2-1). After its inception, no project or projects have been selected nor has any construction begun. In the meantime, Governor Ritter has already committed to cutting the state transportation budget by 33% for the 2009 fiscal year (RMN 1). The continued growth, and thus congestion, of the Front Range, in combination with current economic conditions, presents unique challenges and needs unforeseen by the original planners over a decade ago. Now, reaching solutions that can be implemented under new fiscal constraints requires that the current set of alternatives be reconsidered and the evaluating criteria revised--emphasizing economic benefit-cost analysis, financial feasibility, and public support. This paper will focus on what has been done in the draft Programmatic Environmental Impact Statement (PEIS) for the I-70 mountain corridor, where it is not consistent with current transportation values and goals, and will suggest solutions for improving the ability to implement a project.

## **Overview of the Draft PEIS**

The draft PEIS project, completed in 2004, was designed to select a range of alternative action plans to meet travel demand and reduce congestion on the I-70 mountain corridor. The draft PEIS is an extensive document that includes a list of preliminary options, a breakdown of their projected benefits and costs, and finally a comparison of the alternatives. Also included in the document are a novel travel demand model for traffic out to the year 2025 and beyond, and discussions of compliance with pollution policies, environmental justice within the project, and other resource impacts. However, this paper will focus on the initial filters used to select alternatives and the criteria used to compare the selected alternatives.

Screening of alternatives for the draft PEIS occurred in three tiers. The first level cleared proposals that would address the need to increase capacity, improve access, and decrease congestion. The second level filtered alternatives based on safety, implementation, and environmental and social impact. Finally, the third filter checked the actual "technical feasibility" of the proposals with engineering studies (USDOT 2-1). In the context of the PEIS, the need for increased capacity is defined by a theoretical baseline demand in 2025 determined by a travel demand model constructed specifically for the report. Environmental impact evaluates the project's effect on resources, compliance with national environmental legislation, and "recreation and historic significance" (USDOT 2-1). After passing through each of these filters, a total of 20 alternative action plans and a "No Action alternative" were given to the PEIS for full review (USDOT 2-2). These alternatives included variations on increasing existing rail infrastructure and train usage, an "Advanced Guideway System" for a Maglev train, bus

transit in a guideway, expanding the road to a six-lane highway, "reversible HOV/HOT lanes," and "combination alternatives" (USDOT 2-17). The alternatives were then evaluated within the draft PEIS under criteria strikingly similar to the filters: "mobility, safety, cost, and environmental and community values" (USDOT 2-69). The mobility criterion refers to the ability to induce travel demand relative to the baseline; safety to "projected fatalities per 100 million person-miles"; cost to total capitalization and operations and maintenance; and values to total environmental and social footprint/impacts (USDOT 2-100 - 2-117). But neither the filters nor the comparison criteria accurately analyze contemporary economic benefit-cost, financial feasibility, or public perception of the alternatives. Those are three issues on which this paper will critique the draft PEIS.

## **Critique of Current Filters and Criteria**

### *Benefit-Cost Analysis*

The draft PEIS offers no formal benefit-cost analysis (BCA) of the proposed alternatives, and while it provides the information to do so, the metrics are not congruent. The information that the draft PEIS does provide includes a description of the project, its effect on "future 2025 travel demand," cost, safety, and other descriptors (USDOT 2-17). These values and impressions are then weighed directly against one another in the comparison section of the report. However, there is no cross comparison of values such as cost and effect on "future 2025 travel demand." Since induced demand and the reduction of congestion are the major goals of the project, they are, to all intents and purposes, the benefits of the projects. Yet those benefits are never directly compared in

the draft PEIS to the costs of the projects. Not completing a BCA of the alternatives is a mistake because there is no way to compare or rank the alternatives by their efficacy in terms of net value to society. If maximizing net benefit to society in terms of increased travel capacity or reduced congestion is the ultimate goal, then a BCA is necessary to determine the alternative that provides that maximum. But a BCA is not present in either the initial filters or the evaluating criteria.

The closest attempt at a BCA is what the project calls "Cost Effectiveness Comparisons" and is present in section 2.3.7.7 of the draft PEIS (USDOT 2-114). The comparison attempts to qualify the benefits and costs of each project in a ratio and rank the alternatives based on their proportion. But this is not a true BCA and in its current form could not be modified to conduct one.

The draft PEIS "Cost Effectiveness Index" (CEI) analysis lacks accuracy in measuring costs and benefits that could significantly affect the CEI ranking and a potential CBA ranking. The index compares cost and benefit of each alternative to taking zero action in the formula: " $Cost_{Alternative} - Cost_{No\ Action} / PMT_{Alternative} - PMT_{No\ Action}$ " (USDOT 2-114). PMT equals "person-miles-traveled," which is another measure for travel induced--essentially the benefit of the alternative. From this equation, the twenty alternatives were ranked from most to least cost effective. But the measurements for cost and PMT, or benefit, are not complete and need to be in homogeneous units for a CBA to be performed.

First, the cost calculation is incomplete and would generate different values with secondary economic costs incorporated. "Cost" in the context of the CEI includes the cost of construction and upkeep minus revenue from public transport fees (USDOT 2-114).

Note that this does not include any figures or estimates regarding the burden on persons or the local economy during the construction process. These costs could include lost business to the ski industry, commuter delay, delay of emergency vehicles, delayed shipping, and even a negative aesthetic effect on tourism--in total, a significant cost to society. For this reason, the cost calculation in the CEI is too narrow and does not adequately represent the costs of the project.

Second, the index does not meaningfully calculate benefit, or measure it in dollars--necessary for a CBA. The CEI equation makes a problematic assumption that there is a proportional ratio between travel demand induced and economic benefit or local expenditures per traveler. The assumption is made so that travel demand can be used interchangeably with, and in this case instead of, monetary benefit. But without knowing the exact ratio of induced demand to economic benefit, it is impossible to quantitatively (in dollars) determine the benefits of an alternative, and thus the benefit-cost ratio. While this would not affect the ordinal ranking of the alternatives within the CEI or a BCA, it does allow for an alternative to have a poor benefit-cost ratio but still be highly ranked for cost effectiveness.

Furthermore, the CEI wrongly assumes that this proportionality is equal across alternatives. While this holds true for expenditures collected in the form of tolls or fares, it is not necessarily true for secondary economic benefits. For example, it is possible that induced travel demand in the form of high-speed rail to the ski resorts would generate more secondary economic benefits than the same induced travel on a six-lane highway. If rich ski aficionados have a higher demand for fast rail travel than for driving on a six-lane road, then the mean income of the induced travelers with rail would be higher than with

an expanded road. In the rail case, that would translate into more secondary economic benefits, especially to the ski industry, than the expanded highway scenario. Changing the figures to reflect these differences would in fact change the order of the alternatives in the CEI or a BCA. Therefore, being specific about the value of "PMT" in terms of monetary economic benefit and allowing for different proportions per alternative results in more accurate benefit values.

Between the shortcomings of the cost calculations and those of the benefits calculations, there is significant room for error and inaccuracy in the CEI ranking. And without homogeneous units, there can be no CBA analysis. Aside from the immediate problems of choosing the best alternative, a lack of detailed benefit calculations can be additionally detrimental to implementation, because showing investors exactly how plans will benefit their business or industry is one necessary component to making an alternative financially feasible.

#### *Financial Feasibility Analysis*

Financial feasibility is more critical now than when planning began. Yet the draft PEIS does not contain a true financial feasibility analysis because it omits a descriptive breakdown of costs and a detailed plan of how to meet those costs. The closest analysis to financial feasibility comes in the initial filters, where plans were screened based on "implementation (cost, technology, and constructability)" (USDOT 2-1). However, these were not full-fledged financial analyses; they were simply a way to throw out wildly impossible ideas. The draft PEIS also does not state what eventually will or should be the feasibility criteria. This is a mistake, because the range of costs for the currently proposed alternatives is \$1.31 - \$8.64 billion (USDOT 2-22 - 2-54). The average cost of the current

alternatives is \$4.26 billion. These are very large amounts considering that the Colorado Department of Transportation's entire budget for the 2007-2008 fiscal year was \$1.055 billion (CDOT 7). Meanwhile, the current economic crisis has already forced the state government to cut back on spending for the next year and look for sources of revenue wherever possible. A recent editorial in the *Rocky Mountain News* captures the concern of the public and policy makers: "Fuel taxes alone will not generate enough money to maintain current infrastructure, let alone expand or upgrade it. New ideas need to be on the table now, even if some aren't adopted until the economy improves" ("Next focus: our roads"). This fiscal tightening suggests that meeting expected travel demand is not currently the highest priority of transportation planning.

For the foreseeable future, projects that can generate net revenue for the state or maximize revenue returns to capitalization cost will be more valuable. For this reason, a more detailed financial feasibility analysis is required of the current alternatives and new alternatives. A proper analysis ensures that the very expensive current alternatives are in fact possible to finance, and opens the door for new alternatives that may be more feasible right now even if less effective against congestion. For instance, in the 2004 Colorado Tolling Enterprise (CTE) report, the agency outlines a scenario for tolling the I-70 mountain corridor that could be fully financed without federal funding through bonds and the toll revenue. The scenario, referred to as "I-70 Mountain Corridor - Scenario 3," includes two additional lanes added to the existing road, as well as new tunnel bores at the Twin Tunnels and the Eisenhower Tunnels (CTE 5-18 - 5-19). All six lanes would be tolled, and a minimum toll of \$3.00 per trip between the tunnels in each direction would pay for the cost of the tunnels (CTE 5-18 - 5-19). In the first year alone, the project is

expected to have 18.1 million transactions, which equates to \$64.4 million in revenue (CTE 4-31). In all, the total cost would be only \$1.097 billion (CTE 6-5), roughly 1/4 of the average cost of the current alternatives. Yet of the 20 alternatives in the draft PEIS, not one includes a road toll. This example illustrates why the filters and criteria under the current PEIS are not the most ideal for generating an alternative that can be implemented.

#### *Public Preference Data*

Recent events, specifically the failure of Amendment 52 to the Colorado Constitution, have shown that public perception and involvement is critical in choosing an alternative. Amendment 52 proposed to change the state severance tax laws to limit fiscal spending of the tax revenue and use the excess to pay for construction on state highways, with priority for relieving I-70 congestion (CGALC 13). There may be many reasons for the failure of Amendment 52. However, a recent study by the National Cooperative Highway Research Program (NCHRP) suggests it may be about taxing versus tolling. The 2008 review of currently tolled roads across the U.S. and foreign countries found that for 103 toll programs there was a public opinion support of 57%, compared to a 27% support in 15 tax-based program studies (Zmud 42). This review shows that toll systems are preferred to tax-based programs, but it does not imply that tax-based programs never work. Interestingly, toll-based programs have no representation in the draft PEIS, as none of the proposed alternatives are toll based. This shows an unintentional ignorance of the importance of public perception in the selection process.

What is important is that all cases, tax or toll, were implemented and are working to reduce congestion. Each of these plans had to have characteristics desirable enough to the public to pass a vote or receive congressional approval at some level. Since

representatives are elected by their constituents, it can be said that the public has had either a direct or an indirect influence on these policies. It can also be agreed that a plan that is passed that reduces any congestion will relieve infinitely more congestion than a plan that is not passed. Thus, by focusing on plans with attributes of public interest, we can select for plans that are more likely to be approved and implemented. Yet the draft PEIS does not include public perception analysis in its criteria for evaluation and only weakly incorporates it into its filters in the form of public suggestions for alternatives.

### **Solutions**

The goals of the solutions offered in this paper are no different from the goals of the I-70 mountain corridor project--to pick an alternative action plan that will meet demand and reduce congestion, and can be implemented. However, the emphasis of the solutions in this paper is on the ability for alternatives to be implemented. The following are possible solutions to the implementation barriers of no benefit-cost analysis, no financial feasibility analysis, and little or no consideration of public preference.

Revising the cost and benefit calculations while homogenizing the units will allow for a proper BCA to be performed. Expansion of the cost calculations to include secondary economic costs will result in more comprehensive and accurate measures of the total cost for each alternative. In addition, more precisely studying the economic benefits of each alternative and valuing those benefits in dollars will allow for a complete BCA. Such an analysis brings more concrete affirmation of the value of an alternative to society. In combination with a thorough financial feasibility analysis, the two criteria can select the best alternative for all parties and therefore the most implementable. Thus, a

complete financial feasibility analysis of all alternatives and the inclusion of new (highly feasible) alternatives is necessary.

By adding together the ordinal rankings from BCA and financial feasibility for each alternative, a new ordinal ranking of alternatives can be generated based on the combined ranking of BCA and feasibility. Alternatives that best reduce congestion while being financially feasible will have lower values. Those alternatives with the lowest values based on BCA and financial feasibility will be the easiest to implement. First, they will have measurable benefits to many invested parties, governmental, private, or public. The more support that a plan has, the more likely it is to be passed or financed. For example, with the enhanced benefit-cost analysis, it is easier to pinpoint which industries will benefit the most from a particular alternative. With that information, those industries can then be approached to either politically or financially support the alternative in question. Their support could make the difference between the successful or unsuccessful implementation of that alternative. If they can clearly see the benefits to them of the project, it is logical that they will be more willing to support it. And alternatives with good compromise between effect and feasibility could have sufficient benefits to garner that kind of support. Second, top compromise projects are less likely to prove prohibitively expensive in the coming years. Some may even produce revenue for the state which can be spent on additional road improvements or other welfare projects. Revenue generation is important because, either directly through voting or indirectly through representation, the public has a significant say on the final approval of projects of this scale. Benefiting the economy and supporting welfare projects are two of many characteristics important to the public when considering these projects.

Considering general principles of public preference in the criteria for the PEIS will help choose alternatives that are more implementable. While publicly preferred attributes are unique to each situation and cannot be applied broadly to each plan, it is possible to isolate a few key concepts for evaluation. If those concepts can be identified and incorporated into alternatives, then those alternatives will be more likely to pass a vote or receive approval. The NCHRP has identified eight such key concepts: "The public wants to see the value, the public wants to react to tangible and specific examples, the public cares about the use of revenues, the public learns from experience, the public uses knowledge and information available, the public believes in equity but wants fairness, the public wants simplicity, and the public favors tolls over taxes" (Zmud 45-47). These trends were derived from studies of road improvement and pricing projects across the world. The eight trends were found to be the attributes that generated the most public support for a project or road pricing. What the trends boil down to is that people are more receptive if (1) they understand the benefits to them, (2) they know exactly what is going to be done, (3) it is simple, and (4) it is fair.

It would not be difficult to incorporate a brief analysis of an alternative's compliance with these principles into the PEIS. If added as a criterion to the selection process, considering public preference data would select for alternatives that have significant benefits to the public, are clear and concise, are fair, and thus are most likely to pass a vote or approval from representation. However, it is the combination of all enhancements to the PEIS evaluation process--benefit-cost analysis, financial feasibility analysis, and public preference--that will ensure the best chance for implementation of a good alternative.

**Conclusion**

A decade after the process began to improve the I-70 mountain corridor there is still no project under construction or even a preferred action plan. Yet the Denver Metro area continues to grow and congestion along with it; and unless the solutions proposed in this paper are incorporated into the final PEIS, we are certain to run into further frustration with this project. Incorporating the changes this paper has proposed into the final PEIS will strengthen the range of alternatives and ensure that the final pick is more likely to be implemented.

The successful restructuring of this PEIS to reflect current transportation goals and values will be a model for other congestion and travel demand projects across the state. If the PEIS is revised and a successful solution implemented, then hopefully other major projects in the Denver Metro area can follow in its footsteps. After all, with the current economic recession, it is important for the region and the state to improve revenue and economic benefits wherever possible. The suggested revisions within this paper can accomplish those goals and be a successful model for future projects.

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