Traffic RELIEF *Options Study*

Peak period pricing incentives to relieve congestion

November 2000

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Printed on recycled-content paper.
2000-10654-TRN 00339 tsm

Traffic Relief Options Study

Acknowledgements

Metro, project management and model implementation

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Special thanks and appreciation for the guidance and support provided by the project oversight committees:

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Technical and Public Involvement appendices, which contain all interim study reports, are published as separate documents.

Executive Summary

Introduction

As part of the Intermodal Surface Transportation Efficiency Act, Congress approved the establishment of a Congestion Pricing (now called Value Pricing) Pilot Program in 1991. In 1995, the Federal Highway Administration (FHWA) approved a joint Metro/Oregon Department of Transportation (ODOT) application to conduct a pre-project study of congestion pricing in the Portland area. That study, called Traffic Relief Options: Peak Period Pricing Incentives to Relieve Congestion, commenced in mid-1996. Recommendations were issued in June 1999 and follow-up activities have been ongoing since then.

The purpose of the study was to determine whether peak period pricing is an appropriate transportation tool for the Portland metropolitan region. Several factors led to the study. Rapid increases in congestion and projected continued population growth during the next 20 years created pressure to undertake dramatic action to address the problem. Fiscal constraints and the recognition that building new roads alone was not the best solution led to consideration of non-traditional congestion management tools, such as peak period pricing.

Project goals

Four project goals, developed by the Technical Advisory Committee and the citizens Task Force for the study, were to:

- undertake a technical evaluation of peak period pricing as a tool to manage transportation demand and congestion in the Portland area.
- develop a process for increasing public and political understanding of the concept.
- determine whether peak period pricing is a desirable traffic management tool to reduce peak period congestion in the Portland area in the context of other existing or proposed traffic management programs.
- determine whether support can be generated for a demonstration project and, if so, the parameters of a pilot project.

Evaluation approach

The study approach was to evaluate specific possible projects. Development and review of actual projects and their effects in specific locations was anticipated to be helpful as a tool to determine whether the concept makes sense for the Portland metropolitan area. The project team took a comprehensive approach in studying congestion pricing. All pricing types that were time of day and location specific were reviewed. The categories of pricing initially considered and our definition of them were:

corridor – pricing of all lanes of a highway as well as parallel arterial routes
whole facility – pricing of all lanes of a highway
partial facility – pricing of a single lane of a highway in one or both directions
spot – pricing of a single choke point of a highway or bridge
area pricing – pricing of an entire regional downtown or sub-area destination
parking pricing – ubiquitous pricing of all or most of the parking spaces in a downtown or regional destination.

The core of the evaluation consisted of a series of specific project reviews. The evaluation approach is detailed in Chapter 3 of the full report.

Committee structure

A 15-member citizen Task Force was established to oversee the study. Due to the general lack of familiarity and controversy associated with peak period pricing, the project team believed that support from elected officials and other key stakeholders would hinge on the success of the public acceptance efforts. An independent advisory body of citizens charged with providing oversight and direction to the study was a key component of the outreach strategy.

In addition to the Task Force, local jurisdictions and other interested parties participated in technical and policy advisory committees to the study. The committee structure is covered in detail in Chapter 4 of the full report.

Public involvement

In keeping with our goal of increasing public and political understanding of the concept, the study incorporated an extensive outreach effort. Roughly equal in terms of resources to the technical work program, the Portland public outreach program was among the most extensive of the national pilot projects. This effort is described in Chapter 4 of the full report.

Modeling

Detailed modeling was undertaken to project the effects of the different pricing options. A new tour-based activity model was developed as part of the study. It incorporated stated and revealed preference data from 1994 surveys. This model, described in section 3.2 of the full report, greatly enhanced our ability to predict responsiveness to pricing and analyze ripple effects on the rest of the transportation system. The Portland study was the first regional analysis of peak period pricing to project activity on the specific roadway segment level.

Project outcome/recommendation

The study achieved all four of its initial goals. The Task Force found that, appropriately applied, peak period pricing is a desirable tool to manage congestion and raise revenues in the region. It recommended that peak period pricing be considered whenever major new capacity is added to a limited access highway and that a pilot be undertaken. However, the Task Force concluded that additional corridor level work would be necessary in order to address technical issues and build public support prior to proposing a demonstration project. As a result, the Task Force recommended that additional work should be undertaken and the Joint Policy Advisory Committee on Transportation (JPACT) should identify a pilot within two years. The complete text of the Task Force recommendations is included in the technical appendix to the full report.

Overall lessons learned

- Peak period pricing can provide significant net transportation benefits including travel time savings, reduced travel costs and production of revenues.

- It is important to distinguish the type of benefit when drawing conclusions about peak period pricing. Any study should look at overall societal benefits as well as effects from the public and individual traveler perspectives. We learned:

    - While the more comprehensive types of pricing produce the largest societal benefits, a large portion of these benefits derive from toll revenue. Pricing of existing lanes costs less and produces more public revenue than pricing a single new lane. Pricing of new lanes tends to provide at least as many benefits from the individual users perspective, however.
    - Net traveler benefits are comprised of time savings, changes in costs of tolls and auto operations and ownership. The Task Force and Metro staff question whether we should count the cost savings from reduced auto travel as a true benefit to the individual. Perhaps from the individual's perspective, more travel is better.
    - Benefits from time savings and out-of-pocket costs are larger with partial facilities whereas pricing of existing whole facilities have much more cost savings from reduced auto travel.

- The key to generating revenues is to price a long stretch of congested roadway. The more lanes that are priced and the fewer free alternatives, the more revenues it will generate. On the other hand, it is difficult to fund construction of a new lane based only on toll revenue collected from that lane.

- Public acceptance is essential to serious consideration of peak period pricing. Peak period pricing faces a lot of resistance from the general public. However, people are much more willing to consider tolling if it involves construction of new capacity and/or good non-priced alternatives remain. In this region, only new facilities or added lanes are proposed for examination as peak period pricing projects in the near term.

- A full evaluation of pricing impacts requires sophisticated modeling tools that can address responses to pricing, mode, time of day, destination and route choice by income.

- The study public outreach approach, which focused primarily on the interested public at the beginning of the study, was largely successful. A variety of tools – including workshops, piggy backing information on other efforts, a speakers bureau and an interactive web page – allowed us to educate a large number of interest groups and stakeholders.

- Prospects for study success can be enhanced by using a study committee structure that allows broad represenation of major groups interested in the study, and provides for information exchange between these groups, the study team, policy interests and sources of technical support.

- The approach of beginning with a broad regionwide review of a large number of pricing options, then narrowing to a small number of specific pricing project options had advantages and limitations. The study team believes that the broad-based review was necessary in the Portland area, given the lack of familiarity with tolling and HOV and the history of tackling controversial issues through the regional planning process. Further, definition of specific pricing options, with modeling results, helped focus the debate. However, this phase of the study consumed more resources than had been anticipated. Also, it was difficult to engage the public in the broad regional study.

- A strong media program should accompany any value pricing study. Briefings should be scheduled, press materials should be concise and current, and staff and non-staff contacts should be available to provide information to the press. It is very important to develop a clear, concise project message early in the process. In addition, a study should set up a "quick response" team cultivating "on call" spokespersons with ties to the community in order to respond to media requests.

- There is a need for project "champions" who are respected by the community at large and would willingly serve as representatives of the project. The public tends to be more receptive to messages coming from non-government task force members. It is important to select, develop, and train spokespersons for the project who will be well-received by the public.

- Focused workshops reaching out to particular groups of interested citizens (e.g., the freight industry) can be a very effective communication tool. It is imporant to quantify the effects of pricing on interested groups.

- It is critical to examine equity and who benefits. All projects appeared to provide more benefits for lower than upper income travelers. However, the original measure did not distinguish type of benefit and mode. Further review demonstrated that:

    - The majority of the benefits were coming to transit users. It is important to distinguish the effect of transit from that due to pricing.

- The large transit benefits are the reason low-income travelers appear to do better overall than other groups. However, low-income SOV and HOV travelers did not get as many benefits as those from high and middle incomes.
- Low-income residents did not seem to be bearing the brunt of reduced auto travel due to pricing. The results are mixed, with middle income travelers cutting back as much as low-income drivers in some instances. It is important to evaluate this issue within corridors on a project by project basis to ensure that essential trips are not forgone.
- Middle-and high-income travelers account for most of the increase in HOV travel in options studied. The increase in HOV travel counts as an increase in costs for that class. On the other hand, to the extent that carpooling is a substitute for more expensive SOV trips, an increase in HOV travel can result in a net benefit.

- In sum, it is critical to conduct a detailed review of equity effects for any pricing option. The results are different for each type of pricing. The availability of transit, HOV and other choices are key to whether an option is beneficial for any income group and are the key to insuring that low income individuals share in the benefits of pricing. It may be necessary to consider subsidizing carpooling to open these options to low-income travelers.

- Peak period pricing can be used as a tool to benefit freight travel and manage the impacts of trucking on the rest of the system. Pricing, by providing valuable time savings, can draw trucks, thereby providing financial benefits to the freight industry and moving trucks onto designated truck routes.

- In general, the pricing options support the region's transportation policies and plans. Mobility is enhanced, freight movement is benefited and VMT is reduced where no new capacity is added.

- Tolling enhances air quality, primarily through reducing VMT. However, if an option is adding capacity that otherwise would not be added to the system, VMT increases and air quality is slightly degraded.

- Better tools are needed to properly analyze land-use impacts. Despite the plethora of theories about the effect of pricing on land use, there is little real data in the literature. These effects are important and our analysis suggests the relationship is not straightforward. A land use/ transportation model is needed to further the discussion.

- As a result of this study, peak period pricing is part of the regional planning lexicon. Peak period pricing is now part of the Regional Transportation Plan for the Portland metropolitan area and must be considered whenever major new highway capacity is added.

More specific lessons learned are contained in the full report at the end of each chapter.

Next steps

The Task Force recommendation was incorporated into the 2000 Regional Transportation Plan for the Portland metropolitan area. In future, all studies to add major highway capacity must consider peak period pricing as an alternative. The peak period pricing requirements are called out both as a general policy and with respect to eight specific highway corridor refinement studies.

On-going studies that have incorporated a peak period pricing alternative include the I-5 Trade Corridor Study, which is examining improvements to I-5 across the Columbia River, and the South Corridor study, which is considering interim improvements to the McLoughlin/Highway 224 Corridor. Several additional corridor studies are currently being considered, each of which would include an examination of peak period pricing.

Follow up activities include a final newsletter outlining the entire study process and recommendations. This document is expected to have a shelf life of several years and will be used as an educational tool during the corridor studies. A slide show or other outreach tool that explains how peak period pricing can be used to solve congestion problems and provides guidance for corridor studies attempting to examine this complex issue will also be developed.

1.0 Introduction

1.1 Background

As part of the Intermodal Surface Transportation Efficiency Act, Congress approved the establishment of a Congestion Pricing (now called Value Pricing) Pilot Program in 1991. In 1995, the Federal Highway Administration (FHWA) approved a joint Metro/Oregon Department of Transportation (ODOT) application to conduct a pre-project study of congestion pricing in the Portland area. That study, called Traffic Relief Options: Peak Period Pricing Incentives to Relieve Congestion, commenced in mid-1996. Recommendations were issued in June 1999 and follow-up activities have been ongoing since then.

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- determine whether support can be generated for a demonstration project and, if so, the parameters of a pilot project.

1.2 Organization and purpose of this report

This is the final report for the Portland area study as part of the FHWA Value Pricing Pilot Program. It is intended to provide a succinct summary of the key findings for the Traffic Relief Options study. The primary audiences are FHWA pilot program officials, participants in the pilot program across the country and other jurisdictions nationally and internationally considering undertaking peak period pricing in their regions. Secondarily, it may be used by consultants and academics studying or implementing congestion pricing as well as parties in the Portland metropolitan area with a interest in the broader Value Pricing Pilot Program.

The report is intended to build upon the technical Working Papers and reports on specific public involvement activities. Rather than repeating or summarizing those reports, this report steps back and highlights overall results and lessons learned that are of broader interest and may be useful to other jurisdictions undertaking work on this topic.

The rest of the report is organized as follows:

Chapter 2, Overall Project Structure, outlines key aspects of the study structure. These topics are covered in more detail in later chapters.

Chapter 3, Evaluation Approach, describes the overall evaluation methods, travel demand modeling, the post processing analysis of modeling results and the evaluation of options, which goes into the various narrowing phases of the study.

Chapter 4, Public Involvement, covers the public outreach methods, tools and key findings throughout the study. It also describes the study committee structure and associated lessons learned.

Chapter 5, Study Conclusion, outlines the study's outcome, recommendations and next steps in terms of implementation.

There are two appendices: a technical appendix, which contains all working papers and related reports, and a public involvement appendix, which includes all reports related to that effort. An annotated list of study products is at the end of this report.

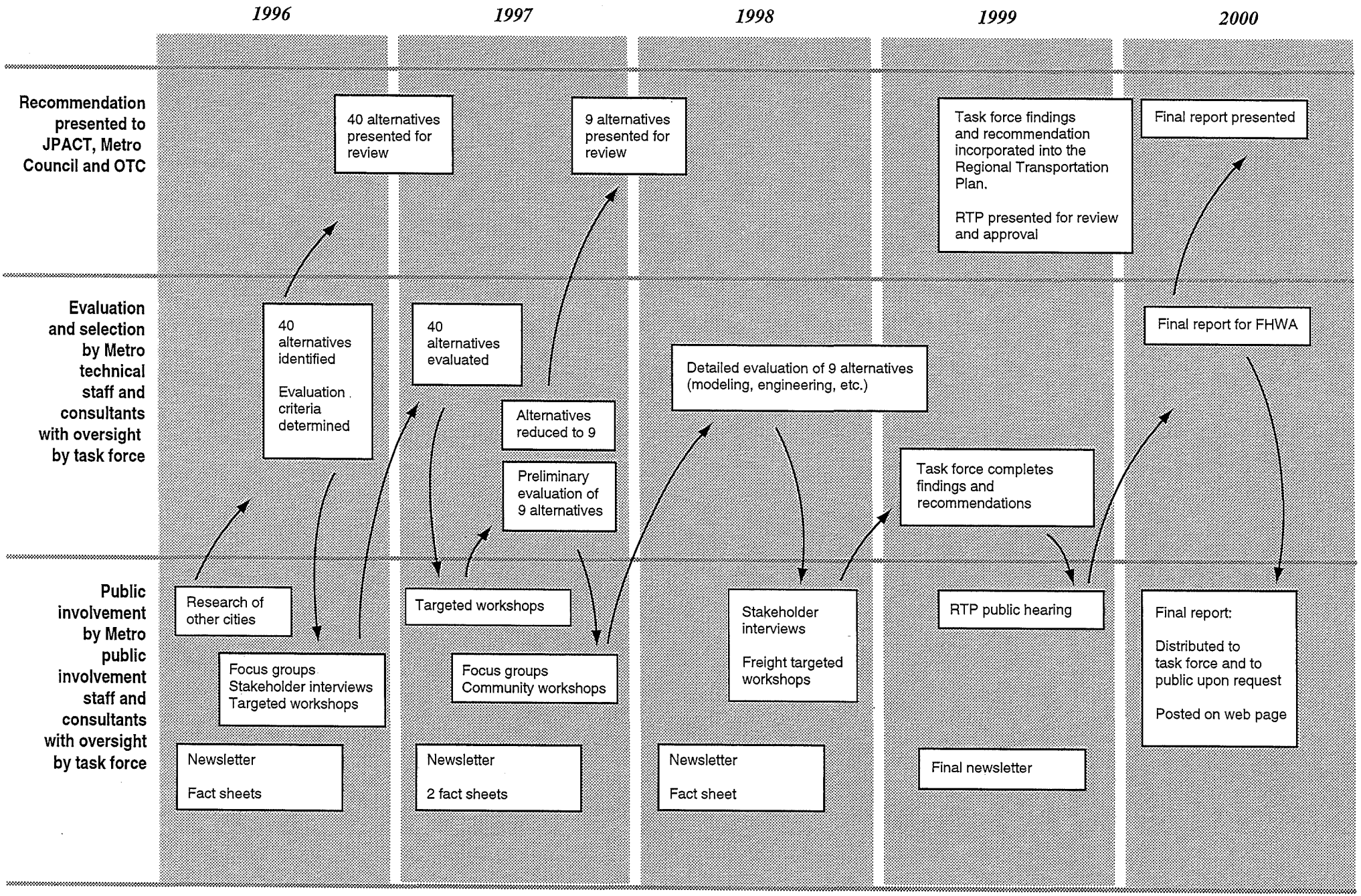
2.0 Overall project structure

The project was structured to address the project goals and objectives. Key components of the structure are outlined in the section that follows.

2.1 Evaluation approach

The study approach was to evaluate specific possible projects. Development and review of actual projects and their effects in specific locations was anticipated to be helpful as a tool to determine whether the concept makes sense for the Portland metropolitan area. The evaluation approach is detailed in Chapter 3. The project timeline follows:

Figure 1: Traffic Relief Options Study Timeline
Activities and Key Tools



2.2 Committee structure

A 15-member citizen Task Force was established to oversee the study. Due to the general lack of familiarity and controversy associated with peak period pricing, the project team believed that support from elected officials and other key stakeholders would hinge on the success of the public acceptance efforts. An independent advisory body of citizens charged with providing oversight and direction to the study effort was a key component of the outreach strategy. The committee structure will be covered in Chapter 4.

2.3 Public involvement

In keeping with our goal of increasing public and political understanding of the concept, the study incorporated an extensive outreach effort. Roughly equal in terms of resources to the technical work program, the Portland public outreach program was among the most extensive of the pilot projects. This effort is described in Chapter 4.

2.4 Modeling

Detailed modeling was undertaken to project the effects of the different pricing options. A new tour-based activity model was developed as part of the study. It incorporated stated and revealed preference data from 1994 surveys. This model, described in section 3.2, greatly enhanced our ability to predict responsiveness to pricing and analyze ripple effects on the rest of the transportation system. The Portland study was the first regional analysis of peak period pricing to project activity on the specific roadway segment level.

3.0 Evaluation

3.1 Evaluation methods

3.1.1 Types of pricing studied

The project team took a comprehensive approach in studying congestion pricing. All pricing types that were time of day and location specific were reviewed. The categories of pricing initially considered and our definition of them were:

corridor – pricing of all lanes of a highway as well as parallel arterial routes
whole facility – pricing of all lanes of a highway
partial facility – pricing of a single lane of a highway in one or both directions
spot – pricing of a single choke point of a highway or bridge
area pricing – pricing of an entire regional downtown or destination
parking pricing – ubiquitous pricing of all or most of the parking spaces in a downtown or regional destination.

3.1.2 Initial project identification

As stated in 2.1, the study approach was to evaluate the concept through specific possible projects. In developing the initial list, staff and members of the TAC considered all major congested roadways and destinations in the region and matched them against the different pricing types before selecting at least one pricing type for each congested location. To aid in this process, staff developed "guidelines" – characteristics that helped determine whether a certain type of pricing was appropriate at a certain location. For example, significant congestion was a requirement for consideration of any location. Also, limited access was a preference for facilities where all lanes were going to be priced; this is because monitoring and enforcing electronic tolling on a facility with numerous access points is difficult and expensive.

The initial project identification resulted in a list of more than 40 options (consisting of a pricing type and location) for review. Charts documenting this review and listing all guidelines are in the appendix to Working Paper 3, contained in the Technical Appendix to this report.

3.1.3 Sequential evaluation

After the initial project identification, a series of reviews was conducted based on criteria described in 3.1.5. First, the large group of 40 options was screened to nine options (including a "no pricing" option), which were reviewed in detail. The detailed evaluation was originally conceived to result in two to three options for final review and possible selection of a single pilot project. However, the Task Force made its final recommendation based on review of the eight options. In addition, after the Task Force made its recommendation, a regional alternative assuming full implementation of the proposed policy was developed and compared to a future transportation system without pricing.

In all, four rounds of review were completed, including the initial project identification process and the regional analysis. For each narrowing step, the Task Force reviewed technical and public involvement results. As the study progressed, the Task Force took a hands-on approach. At each step, Task Force members requested only limited summarization of results needed to handle the data for the number of options under review.

After the initial project identification, while staff, consultants and the technical committees prepared reports evaluating the options against the criteria, the Task Force asked that no specific project recommendations be made. In addition, the Task Force chose to avoid apriori weighting of criteria, so no project ranking was made prior to Task Force review. When reviewing the forty options, the Task Force asked the staff and consultants to indicate for each criterion which third (high, medium or low) the option fell into in comparison to the rest of the options. When the eight options were evaluated in detail, the Task Force asked only that the detailed measures be consolidated into a summary table.

3.1.4 Post-processing model

There was an extensive travel demand forecasting process for this project. That effort is detailed in 3.2. In order to interpret the data that resulted from the travel-forecasting model, ECONorthwest prepared a post-processing model, which calculated a cost/benefit for each option based on the specific roadway segment (link) data. It calculated the total travel time by

vehicle/income class before and after pricing for each time period modeled. ECONorthwest then applied the values of time and costs per mile for auto and transit travel used in the demand model and estimated performance in time periods not modeled. Total operating and capital costs for each option were also developed and incorporated into the analysis. Ultimately, the output produced annual cost and benefit numbers for each option on the priced links and regionwide for each vehicle/income class. Highlights of the types of data generated are described in 3.4.4. The full analysis is contained in Working Papers 6, 9 and 10.

3.1.5 Evaluation criteria

The same criteria were used throughout the project. These were proposed by the technical committees and finalized by the Task Force with input from the public at targeted workshops. Each successive evaluation looked at a greater level of detail. In the early rounds, some criteria were not used because that information was not available or needed at that level. In addition, many criteria such as legality, privacy, technology, institutional impacts affected all pricing options equally and, therefore, were not used to evaluate options. The consultant simply provided a generic discussion of those criteria.

The criteria are listed in Table 2. They are organized by major category. On the right are columns indicating whether or not they were used in each phase of the evaluation. Working Paper 4 describes the initial criteria in detail and proposes how they will be applied in the different phases of the study. Appendix A to Working Paper 9 incorporates and builds on Working Paper 4 to describe how the criteria were used in the evaluation of eight options. To avoid duplication, the individual criteria and measures are only briefly described here.

Implementation

Financial feasibility: This composite measure is an estimate of net revenue to the public sector, specifically:

Net annual revenue = change in annual revenues – change in annual public costs.

The change in **annual revenues** is the increase in public sector revenues (tolls and transit fares) associated with the option. The change in annual **public costs** are made up of annualized highway facility costs (including the costs of tolling equipment), transit operating and maintenance costs, and annualized transit capital costs associated with purchases of new vehicles or facilities.

Demonstration value: Essentially, this criterion was intended to cover what you might learn from a pilot that was not addressed by the other, more project oriented criteria. For Portland, it turned out that what would make the best project would make the best pilot.

Travel system performance

Facility capital and operational costs: This measure is described under "financial feasibility."

Net traveler benefits measure the pricing effects from the perspective of individual travelers. They are calculated from the travel time savings in relation to value of time and out-of-pocket cash costs of travel (i.e., tolls, out-of-pocket auto operating costs and transit fares).

Net societal benefits:

Net annual societal benefits = net traveler benefits – change in annual public costs + increase in toll and fare revenues.

Table 1: Evaluation criteria and how they were used at different stages of the evaluation

Used in the preliminary evaluation of all options		Used in evaluation of 40 options?	Used in evaluation of eight options?	Used in regional analysis?
Category	Sub-category			
Implementation	Legality	N	N	N
	Technology	N	Y[1]	N
	Privacy	N	N	N
	Institutional impacts	N	N	N
	Financial feasibility	Y	Y	Y
	Use of revenues	N	N	N
	Demonstration value	Y	Y	N
Transportation system performance	Costs: Facility capital and operation	Y	Y	Y
	Traveler benefits	Y	Y	Y
	Net societal benefits	Y	Y	Y
	Safety	N	Y	Y
Equity	Availability of transportation options	Y	Y	Y[2]
	Impacts by population group and area	N	Y	Y
	Fairness of cost assignment to businesses and commuters	N	Y	Y
Consistency with land use and transportation plans and policies	Land use	N	Y	Y
	Transportation	N	Y	Y
Societal and market effects	Environmental impacts	N	Y	Y
	Employment and freight	N	Y	Y[3]
	Neighborhood effects/diverted traffic	Y	Y	Y[4]
Public acceptance	By public, interest groups, decision-makers	Y	Y	Y

[1] Evaluated as part of *cost*.

[2] Evaluated as part of *consistency with transportation plans and policies*.

[3] Evaluated as part of *equity*.

[4] Evaluated as part of *consistency with transportation plans and policies*.

Equity

Availability of transportation options: This criterion was measured in early rounds by a review of the transit and alternative route choices available. Later rounds looked at mode split.

Impacts by population group and area: We considered all types of equity but found that the most important types, and the ones we could find data on, were income and geographic. Geographic equity was measured as part of the land-use analysis. The measure examined the changes in accessibility of households to regional centers. In this way, the degree of cost or benefit to a locality would be measured by the impact on its regional center.

Income equity was looked in terms of differences in the cost/benefit analysis from the base system without pricing. The relative performance of the options is assessed using the measurement of traveler benefits relative to base cost by income group and vehicle class for the five modeled time periods. Only options that showed positive effects for all income groups would receive positive ratings. Options that showed positive benefits and favored lower income groups over higher receive two pluses.

Fairness of cost assignment to businesses and commuters: This criterion turned out to be very difficult to measure. Indirect economic effects on businesses are extremely hard to predict in any quantifiable way. As a result, we only looked at the direct impacts on freight (e.g., trucking).

Consistency with regional plans

Land use: We decided that accessibility to key destinations identified in the 2040 land-use plan was an important indicator of conformity with existing plans and policies. The new travel forecasting model, however, develops accessibility logsums for each individual and is not geared to generate accessibility from the perspective of the destination. Thus we used numbers of households that could access the selected destination within a set period of time (e.g., 30 minutes).

Transportation: A qualitative assessment of relative performance was made after looking at multiple measures of transportation performance: VMT, mobility, mode share and freight travel.

Societal and market effects

Environmental effects: The composite measure combines the relative performance of the options in terms of air quality, energy and other environmental effects. The link-based analysis allowed a simplified calculation of air quality and CO_2. Other environmental effects were harder to measure and the study ended up looking only at possible effects of construction.

Employment and freight: Effects on trucks were evaluated as part of Equity.

Neighborhood effects/diverted traffic: The relative performance of the options was assessed using measures of traffic diversion that look at local and collector streets as well as arterials and non-priced highway lanes. The final summary measure combined the two, with an emphasis on neighborhood effects.

Public acceptance

The relative performance of the options is a qualitative assessment based on a compilation of public feedback from focus groups, workshops, interviews and questionnaires. It includes major considerations such as provision of choice, new capacity, perceived need, equity and traffic diversion into neighborhood.

3.1.6 Screening of 40 options

Due to the large number of initial options, it was our intention to conduct a cursory "screening" to identify a smaller number of options for further study. We hoped to base the initial screening primarily on information from other locations and limited local information. However, the available information from other studies about performance of specific types of pricing was too limited to develop guidelines for project selection. In addition, initial model runs were extremely informative, but did not point to any obvious trends by type that could help make a final selection.

Initial model results did highlight the importance of extreme congestion. Twenty options were eliminated based on lack of serious congestion. This could be predicted from the pricing curve, which increases exponentially as a facility reaches capacity. Where there is not significant congestion, the toll must be set too low in order to attract travelers, and revenues do not defray the expense associated with the tolling operation.

All of the remaining options were assigned on the existing four-step model (without any demand runs) and post-processed by ECONorthwest. This allowed a strong basis for judging relative performance, but was resource intensive.

3.1.7 Key findings and lessons learned

Lesson learned: **Establishing guidelines provided consistency and comprehensiveness in initial project identification.**

Lesson learned: **Peak period pricing is appropriate only in situations where there is significant congestion on all reasonable alternatives.**

Lesson learned: **In most cases, taking away a congested general purpose lane and pricing it results in more costs than benefits.**

Lesson learned: **The project specific approach, although resource intensive, was worthwhile for its analytic benefits.**

The examination of peak period pricing through specific projects allowed the evaluation to focus on actual effects and avoided the temptation to digress into philosophy or theory. The tendency when having a general discussion of peak period pricing is for each participant to refer only to their favorite (worst or best case, depending on their predisposition) scenario. In that situation, each person continues to hold onto his/her original preconceptions because actually there is no common data set on which to base a real discussion. The study of actual pricing types in specific locations allowed us to develop results and to focus the debate.

One drawback to studying actual possible pricing projects is that concerns about implementation of peak period pricing arise early in the study. When you are examining the effects of pricing in a specific location, there is always the potential for media sensationalism. A newspaper may run the headline "Study proposes tolling highway X" (or "all of the highways in the region") when the study is trying to learn about what tolling can do on a large number of study options.

It also is expensive to examine such a broad range of pricing types and locations. As described above, in the evaluation of 40 options, we ended up modeling many more than anticipated due to the limited worldwide experience with peak period pricing.

Lesson learned: **Our experience suggests the need to look at pricing as a general policy and then at specific locations to see whether pricing could solve the particular problem in that location.**

The Portland metropolitan area places a great emphasis on regionwide long-term planning. Consideration of a controversial topic like peak period pricing, particularly since the region has none of the typical precursors (i.e., toll roads or carpool lanes), required an overall policy review prior to implementation.

In the Portland area, we decided to answer the general policy question through the examination of specific project types and locations with the hope that this work could then be used to select a pilot project. This project-specific approach is very resource intensive. The project review required extensive specification, modeling and evaluation of numerous options. Undertaking a regional study required a regional public outreach campaign, including stakeholder interviews, focus groups, workshops and continual updating of the numerous media and elected officials in the 26-city region. Most of the project resources were required for this regional effort.

On the other hand, the decision to pursue a specific pilot project requires a very intensive local effort that goes well beyond the broad brush completed for the regional analysis. Based on our public outreach, we felt that political and technical issues could not be fully identified or addressed at the regional level. Participants indicated that peak period pricing was much more acceptable when understood as solving a local problem. As the study progressed, it became apparent that a full corridor-level alternatives analysis (where pricing would be compared to other solutions such as general purpose and carpool lanes) was needed in order to build the necessary public support for implementation.

Lesson learned: **Area pricing is difficult both technically and politically.**

In order to even implement pricing at all, it must be a very well-defined area with limited entrances and exits. The potential political backlash is significant because businesses and residents in an area to be priced are fearful that their area will become less attractive to customers and more expensive to operate within. This is particularly true if the area economy is retail-dependent. Retail trips are considered footloose and the businesses would not be able to withstand the loss of customers if it is more expensive to shop there. The area must be an attractive enough destination to continue to compete with other areas even though drivers have to pay more to travel there.

Lesson learned: **It is extremely difficult to make parking pricing comparable in effect to roadway pricing (e.g., ubiquitous by time of day and location).**

During the initial project identification, a review of parking pricing strategies determined that it is virtually impossible to ensure that parking prices are charged and vary by time of day unless government owns all parking or has legal authority to impose a surcharge on private parking spaces.

Lesson learned: **The evaluation criteria were generally helpful and agreed upon.**

Feedback from the public indicated that we had covered the major issues. It was especially helpful to group the criteria into a small number of major categories. With at least 19 criteria, having six major categories was an important simplifying device for making decisions.

Of the criteria, the most helpful were finance, transportation system performance, neighborhood effects and public acceptance. Finance was important because it gave us a single number that indicated the amount of unfunded costs. It was simple and clear. Transportation system performance was covered in a cost benefit equation discussed in section 3.3. Neighborhood effects was measured through traffic diversion onto local streets and arterials. This was an important issue for the public and the measure we used addressed it well. Public acceptance, covered in Chapter 4, was a key criterion. The consultants were able to boil all of the feedback received into a single measure by weighting the several issues that appeared to be most important to the public.

Lesson learned: **The criteria that are the same across options (legality, privacy, etc.) need to be tracked generically so that steps are taken to address problems raised by them.**

Examples included obtaining needed legislation, offering privacy solutions such as blind accounts and addressing technical issues such as how we treat visitors if tolling all lanes.

Lesson learned: **Implementation was an important consideration, but not easy to gain consensus on.**

It was difficult to reach agreement on the importance of the major category of implementation. Members tended to rank it as either the most important or the least. Those who weighted it heavily felt that pragmatic ability to implement the project was a primary consideration. Others felt that the overall value of the project should come first and implementation should follow. One suggestion was to use it as either an initial or final screen (i.e., a project should be implementable in order to be considered.) In the end, we focused on "financial feasibility." Other aspects were used as a screen or were set aside for later.

Lesson learned: **If speed of implementation is a major concern, it merits a separate criterion.**

One issue not addressed explicitly by other criteria was speed of implementation. Legality, financial feasibility, public acceptance and other criteria get at implementation. However, ownership of right-of-way, project complexity, status of design, etc., should be considered as well if speed of implementation is a key consideration. For our study, a side analysis was done.

Lesson learned: **While the use of cost/benefit had advantages and disadvantages, overall it was helpful to the project.**

The transportation system performance criterion relied on a cost/benefit analysis. It allowed quantification of benefits based on time and cost savings, which traditionally has not been done for transportation projects in this region. This simplifies the analysis by synthesizing the entire modeling result into a single dollar value. In the past, a number of transportation and economic performance indicators have been used and it is often difficult to compare or compile them. The sheer number of factors can lead to confusion and misinterpretation.

The cost/benefit also helped discipline us to avoid double counts since there was really only one number that represented the entire transportation performance of a project. That single value could then be more easily compiled with the other criteria (e.g., environmental effects, public acceptance, consistency with transportation plans and policies, etc.). It also allowed the project team to review equity at a greater level of detail than most studies. Finally, the public wants basic questions answered about the costs of a project; this approach provided that information.

On the other hand, the use of cost/benefit analysis can lead to skepticism if there is not agreement on key assumptions, such as value of time for different income groups. It also can be difficult to explain to public. In general, people tend to think individually – "what is my cost or benefit?" It is difficult to comprehend a total societal number and the analysis involved the use of economic calculations, such as consumer surplus, which are very opaque. Finally, the use of different values of time for each income group may be questioned, particularly by those involved in environmental justice issues.

Overall, the cost/benefit was useful to the TRO Task Force. Members felt comfortable enough with the numbers to rely on them. It allowed us to include a great deal of complex information while maintaining a manageable analysis. However, cost/benefit numbers must be clearly and succinctly explained to the public. Further, the public may not be swayed by overall societal benefits, and may request information on the individual level.

Lesson learned: **Equity is an important consideration and its analysis is complex.**

It was a key consideration for the public and the Task Force. There are a variety of measures for income equity (i.e., absolute $ or in comparison to base costs, number of trips or PMT). Each equity measure can yield very divergent results, so it is an important consideration. Working Papers 9 and 10 examined benefits by income in terms of total dollars, per person mile of travel and as a percentage of base costs. The equity subgroup of the Task Force decided to base its final measure on the comparison with base costs. Total dollar measures can be deceptive in that the income groups are different sizes. Benefits per PMT is a relative measure that accounts for the different amounts of travel undertaken by each group. However, benefits per base costs, also a relative measure, was thought to be better because it is more linked to willingness/ability to pay.

Finally, the study needs to determine what measures success. Is it enough that low income residents are not made worse off compared to the base or must pricing result in an increase in well being? What about high-income residents?

Lesson learned: **Consistency with land-use and transportation plans and policies was an important consideration for transportation planners, but not the public.**

It was difficult at first to identify appropriate measures because of the tendency to overlap with transportation performance. In the end, we identified some measures, such as speed on major highway lanes, which were not duplicative. However, this criterion required familiarity with land-use and transportation goals and, for that reason, was never a major consideration for the Task Force.

Lesson learned: **It is hard to be comprehensive about environmental effects in a regional analysis.**

Air quality, energy and construction can be reviewed on a cursory level.

Lesson learned: **The Task Force agreed not to apply explicit weights to the criteria and this approach worked well for them.**

While lack of explicit weights can pose problems if groups cannot come to consensus (because of the difficulty of dissecting the source of disagreement), this group came to agreement about option rankings. The Task Force had discussed the relative importance of the criteria and each member submitted their criteria priorities. Transportation performance and public acceptance were basically tied for the most important criteria. Equity, societal effects and implementation were next. Consistency with transportation and land-use plans trailed behind the others.

The lack of explicit weightings can make the process seem like a black box to those not involved in the decision and can make it difficult to justify conclusions. Some TAC members were concerned that the final recommendations were based too much on public acceptance or resulted from political pressure. The lack of official weights made it difficult to explain the process.

3.2 Modeling

Metro (with consultant assistance) developed a new tour-based activity model for this study. Modeled travel demand was then assigned with EMME2 on the regional roadway network as modified for each pricing option. See Appendices B and C to Working Paper 9 in the Technical Appendix to this report for details and contact information.

The new travel demand model allowed us to:

- Maintain sensitivity to income. This is important because income affects a traveler's choices.
- Ensure that pricing effects are accounted for in activity choices (i.e., need for travel), time of day choices, destination choices, and mode choices.

As a consequence of having the new tour-based activity model, the study was able to conduct a cost benefit on a link basis by mode and income group. This capability allowed us to analyze equity in a much more detailed and realistic way than other studies. This was a big advantage since equity is a key concern locally and nationally.

The model development process for such models is extremely challenging.

- Many key variables are included in the model that address levels of service (auto and transit), urban design, demographics and socio-economics.
- Complex data specifications (nests, feedbacks).
- Revealed and stated preference survey data required.
- In addition, since this type of model is on the cutting edge of the field, model development and quality control of results were more difficult. There is not a lot of experience with similar models to draw from.

Entirely new application procedures had to be developed for use with the new model, which was time consuming and difficult. The new application process was also very detailed and time-consuming. Elements worth noting include:

- The toll estimation process is complex. For each time period (5), multiple assignments are required to estimate the link demand and determine the time equivalent of the toll cost. Special marginal-cost functions are appended to the delay functions for this purpose. It is then necessary to weight the toll time by the values of time for the demand (stratified by the link user groups).

- Each auto mode (SOV, HOV) stratified by income (high, medium, low) is given a unique path choice due to tolling. This is predicated by the value of time effects. Separate model input skims are required for each strata.

- Multiple nesting and feedback loops are built into the model. This makes for a robust, well-integrated model. But it also means that each model step is entwined with another. The debugging of model anomalies is a formidable task.

- The model application must be iterated multiple times using successive averaging techniques. This is essential to achieve equilibrium between the input and output toll value and skim matrix.

- A multi-class assignment using generalized costs is required to maintain the unique sensitivity of each vehicle class to the toll. In the Portland study, each assignment required approximately 12-15 hours (500 Mhz DEC Alpha, 1300 zones, 20,000 one-way links). Five time periods were used in this study, each having a different toll value due to the varying demand. Hence, 60 to 75 hours of computer time were required to complete the resulting assignments.

Metro has already begun a program to enhance the pricing model. A key improvement focuses on the use of a population synthesizer (i.e., each individual will be modeled uniquely). This characteristic will produce a "trip diary" for each person in the region. This feature enables a more rigorous analysis of the data. For example, since each traveler is uniquely earmarked, equity analysis can be performed at a level of detail not currently possible.

3.2.1 Key findings and lessons learned

Lesson learned: **Rigorous modeling tools are needed to effectively analyze the effects of peak period pricing.**

Key issues are ability to predict and track traveler response to pricing based on income in terms of mode choice, route, destination and time of day. Current tools may address some of the preceding issues, but none in a comprehensive, integrated manner. This study was the first in the nation to benefit from this level of model analysis. We had much greater ability than other studies to predict travel response over specific links throughout the region.

Lesson learned: **Careful budgeting and scheduling is required.**

As noted above, both the model development and the model application process are arduous. Because the model was developed as part of the study, evaluation elements were dependent upon its completion. Both the schedule and the grant budget were exceeded in the Portland study. Funds were made up by Metro with model development grant, general planning grant and excise tax funds.

Lesson learned: **The consistency of model results between studies can sometimes be an issue.**

In the Portland study, due to time constraints, full calibration of the new model could not be completed prior to its use. A pivot-point approach was used to maximize use of the model sensitivity, but yet maintain consistency with past and current work. While an accepted method, it was a new tool in this region and additional time and analysis were required for quality control.

Lesson learned: **The model framework (variables, nests, feedback loops) are appropriate for use anywhere.**

However, the model may need to be re-estimated to determine coefficients that are appropriate for the specific locale. As the specification of individuals and household types become more disaggregate, researchers may find that models may become more portable between regions.

3.3 Detailed Evaluation of Options

3.3.1 Detailed evaluation of eight pricing options

The eight options were evaluated in a fair degree of detail. Full demand model runs as well as conceptual engineering and preliminary cost estimates were completed for each option. The complete results are contained in Working Paper 9. Following is the final summary matrix that contains composite measures for each major criterion. See 3.1.5 for a brief narrative explanation of the various measures.

Table 2: Summary evaluation measures

Criterion / Pricing Options	IMPLEMENTATION	TRAVEL PERFORMANCE		EQUITY		CONSISTENCY WITH POLICIES	SOCIETAL AND MARKET EFFECTS		PUBLIC ACCEPTANCE
	Finance/Net Public Costs	**Net Traveler Benefits**	**Net Societal Benefits**	**Income Group Impacts**		**Land Use and Transportation**	**Environmental Impacts**	**Diverted Traffic**	
	Total Rev - Public Cost/yr ($million)	Traveler Benefits + Traveler Cost Savings ($million)	With Productive Toll Use (4b) ($million)	Are Income Groups Effected Equally?	Is there a positive benefit to Trucks?		Is there a Reduction in Pollutants?	Overall Effect of Diverted Traffic	Choice, Effective, Equity, Etc.
A I-5 South: Rev HOT, I-405 to 99W	1.8 - 19.8 = (18)	6.5 + (6.4) = 0.1	(17.9)	+ +	-	O	-	-	O
B I-5 South: 1-405 to 1-205	30.5 - 5.6 = 24.8	(6.4) + 14 = 7.5	32.4	+ +	+ +	O	+	- -	- -
C I-5 North: I-405 to Delta Park	24.3 - 4.4 = 19.9	13.6 + 3.4 = 17	36.9	+ +	+ +	O	+	-	- -
D I-84: Grand Ave to 238th Ave	24.8 - 3.8 = 21	10 + 11.9 = 21.9	42.9	+ +	+ +	+	+	-	- -
E Highway 26: Vista Tunnel to 185th	4.1 - 4.4 = (0.3)	21.1 + (7.4) = 13.7	13.4	+ +	O	O	-	+	+ +
F Highway 217: Highway 26 to I-5	2.2 - 7.2 = (4.9)	15.6 + (8.6) = 7	2.0	+	+	+	-	+	+ +
G SE McLoughlin: Ross Is. Bridge to Hw	2 - 3.9 = (1.9)	7 + (4.6) = 2.4	0.5	+	O	O	-	O	O
H Highway 43 near Sellwood Bridge	7.4 - 1.1 = 6.3	(5.8) + (9.6) = (15.4)	(9.2)	-	- -	-	-	-	- -

Performance Ratings:
+ + positive
+ slightly positive
O neutral
- slightly negative
- - negative

Note: The environmental numbers indicate only relative performance. In general, pricing of roads has positive effects on air quality and energy usage. The options that add new capacity (E, F and G) increased VMT due to more travel, which resulted in very slight increases in pollutants. It is anticipated that these increases would be higher if the same capacity were built without pricing.

3.3.2 Regional analysis

Based on the detailed evaluation of eight options, the Task Force concluded its work and recommended that peak period pricing be considered on all major new highway capacity in the region[5]. A peak period pricing policy incorporating Task Force recommendations was included in the 2000 Regional Transportation Plan. In order to answer questions about the cumulative effect of peak period pricing in the region, Metro and ECONorthwest prepared a regional analysis. The regional analysis compared peak period pricing to conventional funding on all major new highway projects proposed in the Regional Transportation Plan. The full results are contained in Working Paper 10: The Effects of Peak Period Pricing on Proposed Highways in the Portland Metropolitan Area. The summary evaluation chart from that report follows. Key findings and lessons learned are presented in the next section.

[5] The full Task Force recommendations are included in the Technical Appendix to this report.

Table 3: Regional evaluation summary

Criteria	Pricing Alternative RTP: Peak Pricing	RTP: Conventional
IMPLEMENTATION		
Financial feasibility (2000 $m) Tolls + gas tax revenues – public costs Lifecycle costs, 30-year projection, construction in 2015	612.8 + 703.4 – 1,316.2 = 0	1,210.1 – 1,210.1 = 0
TRAVEL PERFORMANCE		
Net traveler benefits (2000 $m) Lifecycle cost 30-year projection, construction in 2015	2363.8	1046.0
Net societal benefits (2000 $m.) Net traveler benefits – public costs + total revenue Lifecycle cost, 30-year projection, construction in 2015	2363.8 – 1316.2 + 1316.2 = 2363.8	1046.0 – 1210.1 + 1210.1 = 1046.0
EQUITY		
By income group	+ +	+
Trucks	O	+
CONSISTENCY WITH POLICIES		
Land use and transportation	+	O
SOCIETAL AND MARKET EFFECTS		
Environmental (air quality and energy)	-[6]	- -
PUBLIC ACCEPTANCE		
Measurement	Unknown	Unknown

Performance ratings: + + positive, + slightly positive, O neutral, - slightly negative, - - negative

[6] The slight negative rating results from an increase in emissions. For the other environmental measure, energy, peak period pricing, had a slight positive effect. The increase in air emissions was expected for both alternatives because they added significant highway capacity that was not in the base (which include none of the major new highway capacity projects analyzed here). The key is the relative performance of the two alternatives, since the base is not a realistic option.

3.3.3 Key findings and lessons learned

Lesson learned: **Tolling, when properly applied so that traffic has reasonable alternatives and/or parallel congested routes are priced, appears to have significant potential benefits both to the individual traveler and society as a whole.**

Implementation

Lesson learned: **Revenues are closely tied to congestion.**

The key to a successful tolling project is to identify a long stretch of congested roadway. The more lanes that are priced and the fewer free alternatives, the greater the revenues. The level of tolls that can be charged also increases exponentially as a facility nears capacity. About half of the initial 40 options were dropped out of consideration due to lack of congestion. In that round of analysis based on the 1994 build year, most tolls were less than 10 cents per mile traveled. In 2005, tolls ranged from 10 cents to 15 cents per mile for partial facilities and 20 cents to 50 cents per mile traveled for whole facilities and corridors.

Lesson learned: **Difficult to finance new capacity with tolls.**

Peak period pricing of existing facilities, where all lanes are priced, generates significant net revenues. On the other hand, it is very difficult to finance a new lane based only on tolls from that lane. The biggest obstacle to partial facilities is that the lanes compete against untolled lanes immediately adjacent to them. This seriously impacts the amount of revenues that can be generated. In addition, the cost of new construction, especially in an urban area, is growing rapidly. Most roadways in the Portland area are expected to cost at least $8 million per lane mile. In the regional analysis, most of the proposed new highway lanes were expected to only cover 30 to 40 percent of total capital costs during their lifecycle.

Transportation performance

Lesson learned: **Net societal benefits tend to be greater for whole facilities.**

In the initial screening, partial facility pricing was very competitive with whole facility pricing in terms of net societal cost/benefits whereas the more comprehensive options performed best on this criterion in the detailed review. There appear to be a number of reasons for this. Because only route choice traffic assignments were performed, cost savings from reduced auto travel and benefits from increased transit were not captured in the initial screening. Without mode choice, the true benefits from whole facilities are understated because traffic is being pushed off of the priced facility without good alternatives. In addition, early capital cost estimates for new construction were increased as more information was developed whereas per vehicle costs for operation of priced lanes came down during the study timeframe. Finally, initial runs were done based on 1994 traffic volumes whereas the detailed analysis assumed a 2005 build year. The projected toll revenues for all options was higher in the later build year due to increased congestion and those options that were pricing more capacity (such as whole facilities) benefited the most.

Lesson learned: **Partial facilities have high costs relative to revenues.**

Safety and operational issues for partial facilities (e.g., the need for shoulders, possible merge weave conflicts and the requirement for some type of lane separation) adds to the costs for those options.

Lesson learned: **Most peak period pricing options produced net benefits.**

Of the projects studied in detail, most (six out of eight) had positive net traveler and net societal benefits. The two that had negative cost/benefits were Option A, a reversible lane on I-5, and Option H, spot tolling of the Sellwood Bridge, both of which caused inefficient diversion onto already congested facilities. The reversible lane was designed to take away a lane from the non-peak direction. However, as with many of the highways in Portland, the peak on I-5 south of the city is fairly bi-directional. Thus, the option created serious congestion in the "non-peak" direction. The Sellwood Bridge has no nearby roadway alternatives and many circumferential trips, which are poor candidates for transit. Thus, the option caused additional VMT and time delays as autos were diverted out of direction onto already congested roads.

Lesson learned: **The evaluation of transportation performance depends on whose perspective and the type of benefit that is being measured.**

The more comprehensive options had vastly higher net societal benefits. Whole facilities and corridors had net societal benefits in the $30 million-$40 million per year range as compared to $0-$15 million for the single lane options. The biggest reasons for this are the difference in toll revenues and the higher auto cost savings from reduced VMT.

In terms of traveler benefits, which looks at the perspective of the individual, the two types of facilities appear to be quite competitive. Some of the more comprehensive options had negative traveler benefits due to spillover onto other congested routes. Net traveler benefits range from $.1 million-15 million for partials and from -$15 million to $22 million for the more comprehensive options. In fact, when cost savings from reduced auto ownership are excluded, the partial facilities out-perform the other options

Equity

Lesson learned: **Based on Working Paper 9, we observed that in relation to base costs, the benefits of pricing are spread progressively, with the lowest income group gaining the most.**

Benefits as a percentage of base costs was selected as the preferred measure because base costs should be an indication of ability to pay. Total dollar benefit, which does not account for the size of the group or the value of time, tends to be higher for the highest income group. Benefits per PMT are distributed fairly evenly among the different income classes. With PMT, the regressivity disappears altogether for the more comprehensive types and is moderated for partials.

Table 4: Annual net traveler benefits by income group relative to base cost[7]

Option	Net traveler benefits relative to base cost 2005 (%)				
	All classes	Low income	Middle income	High income	Performance rating
A I-5S, reversible	24.7	55.7	46.5	24.0	+ +
B I-5S, whole	20.7	110.8	75.6	28.3	+ +
C I-5N, corridor	131.9	210.9	162.9	124.5	+ +
D I-84, whole	153.7	253.6	178.8	139.6	+ +
E Hwy. 26, partial	133.7	200.3	151.9	157.2	+ +
F Hwy. 217, partial	79.7	74.9	95.4	97.5	+
G McLoughlin, partial	42.3	53.8	58.2	46.6	+
H Hwy. 43, spot	(90.4)	(79.1)	(77.9)	(102.2)	-

Performance ratings:
+ + positive and progressive
+ positive for all groups
O neutral
- negative for at least one group
- - negative and regressive

[7] Working Paper 9 – Evaluation of Peak Period Pricing Options, May 1999, Metro

A more detailed review on the results of Working Paper 9 was conducted to investigate whether certain modes or types of benefits favored one group over another. We learned that, in general, the largest benefits to the individual accrue to transit users. This makes sense for two reasons. First, the tolls paid by SOV and HOV travelers are assumed to benefit society as a whole and thus are not included in this analysis. Second, additional transit service, provided as part of each option, is assumed to be paid for by society as a whole.

One issue that came to the fore in the detailed review, however, was that because the additional transit was not in the base, it is unclear whether benefits to transit users accrue from the pricing or the additional transit capacity. This is important because the size of the transit benefits tends to skew the overall equity results when all modes are combined. Therefore, a look at benefits by mode became imperative as a means to fully understand the effects of pricing.

Net traveler benefits by mode and income per base costs demonstrate the following trends. Transit benefits all income groups, but especially the high-income traveler. Since toll revenues are considered a cost, not a benefit to users, most SOV and HOV classes suffer losses. The high-income SOV and HOV also do better in these classes incur disbenefits in an equity analysis,

especially on the partial facilities. Looking at the modal results alone, one would think that the high-income travelers should come out ahead of other groups overall. However, the low-income groups' more heavy reliance on transit gives the transit component more weight all modes are combined. Since the transit users' benefits are overwhelmingly positive, in a combined measure, low-income travelers generally come out ahead of other income groups. This trend is not as strong for partial facilities, where the transit benefits are smaller for all classes.

The portion of the benefits related to time savings and out-of-pocket expense of tolling and transit fares (consumer surplus) was looked at for each income class and mode in terms of total dollars, per PMT and trip and in comparison to base costs. The most obvious trends are by mode, not income. Almost all benefits are from transit users and the more comprehensive options actually have negative effects for SOV and HOV drivers. In the consumer surplus calculation, the high-income group, regardless of mode, tends to benefit most per PMT on partial facilities but not on whole facilities. Transit benefits are slightly weighted to the higher income groups. When looking at auto users, middle-income SOV and low-income HOV users fare slightly worse than the other classes.

In terms of cost savings from reduced auto ownership, all groups increased travel on partial facilities and thus incurred greater costs on these. High-income travelers had the greatest increase in HOV travel, which resulted in more costs for this class of users. The low-income SOVs incurred the greatest costs due to increase in travel as a result of added capacity on partial facilities. In the case of partial facilities, these losses had more influence over the total modal benefit calculation because the transit benefits are not as high on partial as whole facilities. Thus, in a couple of instances, low-income travelers were not the biggest beneficiaries.

On whole facilities, low- and middle-income travelers cut their driving the most, which resulted in more cost savings for those groups than those with high incomes. While paying less appears to be good, the decision to travel less or use a different mode may be viewed by the individual as a drawback to pricing. Further, if a significant portion of total trips are cut, this might indicate that non-discretionary trips are threatened. Michael Cameron, in a study for the Environmental Defense Fund of various regionwide pricing options in Southern California, found that the low-income travelers' main benefit from pricing was cost savings from reduced travel.[8] He found that an alternative where all roads were priced resulted in reductions of 25 percent in base travel that would likely be cutting into non-discretionary trips.

The tendency for low-income travelers to reduce SOV trips predicted by Cameron only appears here when existing capacity is priced and, even then, to a much less pronounced degree. Low-income solo drivers avoided the priced facilities more than any other group. As an example, low-income SOV travelers were projected to cut PMT on the priced links by 14,359 on a 16,696 base during the afternoon peak on I-5 South, the largest percentage change for any income group. However, most of this travel is diverted to other routes or times of day. The total SOV PMT changes for the five modeled time periods, however, is actually greatest for the middle-income traveler and these are still less than 1 percent. Low-income travelers had the next greatest percentage reduction and high-income travelers had the least.

[8] Michael Cameron, Efficiency and Fairness on the Road: Strategies for Unsnarling Traffic in Southern California, 1994, Environmental Defense Fund

When looking at the detailed evaluation of individual facility options, the greater overall "benefit" to low-income travelers is due to the transit effects. For partial facilities, this benefit is eroded because transit changes are less significant when one lane is priced and the increased SOV travel on the added lanes adds costs. Overall, any impact on the low-income traveler is not going to appear very significant since these are regionwide numbers and only a single facility is being priced.

The regional analysis results should be more significant as more highways are priced. It also addresses the lack of capacity consistency in the detailed review of eight options, since the two regional alternatives evaluated in this analysis have the same amount of new capacity. One alternative is priced and the other funded through conventional means. They are compared to a base without the eight major highway improvements that are tolled in the peak period pricing alternative.

Table 5: Net traveler benefits in year 2020 by income group and travel mode relative to base cost[9]

		Net traveler benefits relative to base cost (%)	
		Pricing alternative	
Income class	Travel mode	RTP: peak pricing	RTP: conventional
All classes	SOV	1.4	0.1
	HOV	0.9	1.1
	Transit	4.6	4.2
	Total	2.1	1.2
Low income	SOV	4.4	(1.1)
	HOV	(2.7)	0.2
	Transit	4.2	3.8
	Total	3.0	0.7
Middle income	SOV	0.4	(0.1)
	HOV	1.5	1.0
	Transit	4.6	4.2
	Total	1.6	1.1
High income	SOV	1.2	0.6
	HOV	2.2	1.6
	Transit	4.9	4.4
	Total	2.1	1.5

[9] Working Paper 10 – The Effects of Peak Period Pricing on Proposed Highways in the Portland Metropolitan Area, September 2000, Metro

In looking at Table 4, the percentage benefits increase over the base alternative in Working Paper 9 ranged from 24 to 150 percent. The percentage increased when new capacity was added and if the option flowed freely. Similar results for Working Paper 10 are shown in Table 5. It demonstrates that when new capacity is priced, the benefits of the peak period pricing option were, on average, twice that of the base. The benefits are even higher (three times the base) for low-income travelers.

Working Paper 10: The Effects of Peak Period Pricing on Proposed Highways in the Portland Metropolitan Area also provides further information about the source of benefits. In this case, the greater benefit to low income travelers appears to derive from a combination of reduced SOV travel and transit use. The time savings and out-of-pocket expenses that comprise traveler benefits shown in Table 5 indicates that benefits are heavily weighted to transit users. This result is consistent with that found in Working Paper 9. However, Table 6, which shows the costs related to auto ownership, indicates that low-income SOV drivers actually traveled less in the five time period modeled under the peak period pricing alternative than in the base without highway improvements. This differs from the result for partial facilities in Working Paper 9, probably because of the inclusion of facilities such as the I-5 bridge, where all lanes are priced. Low income SOV are the only income groups or mode in either regional alternative that did not increase travel during these periods. As a result, this group saved 4.5 percent over base costs for auto ownership. On the other hand, low-income travelers did increase HOV travel (and carry increased costs as a result). And since all income groups travel more by transit, it is possible that the SOV trips were made up in other modes or times of day.

Lesson learned: **Overall, the analysis in this study supports a conclusion that peak period pricing provides economic benefits to all income classes and is progressive in its distributive effects.**

Increased use of transit and HOV, and improved time saving for those modes, appears to be the primary cause of the overall benefits. For low-income travelers, cost savings from reduced SOV travel can also be a factor, depending on the configuration of the pricing option. It is possible that, unless there are viable unpriced alternatives, pricing could result in a reduction in low-income auto travel. And careful evaluation on a project specific basis is needed to determine whether these trips were made up in other modes, routes or times of day.

Lesson learned: **In the end, it will be important to look at changes in travel by income group for a specific project. The specific type of pricing, and mitigating conditions like the addition of transit and availability of alternative routes or modes, ultimately determine whether the option is equitable.**

Table 6: Traveler benefits in year 2020 by income group and travel mode relative to base cost[10]

		Traveler benefits relative to base cost (%)	
		Pricing alternative	
Income Class	Travel mode	RTP: peak pricing	RTP: conventional
All classes	SOV	1.3	1.7
	HOV	2.3	1.9
	Transit	4.6	4.2
	Total	2.2	2.3
Low income	SOV	(0.2)	0.7
	HOV	0.7	1.1
	Transit	4.2	3.8
	Total	1.3	1.7
Middle income	SOV	1.0	1.6
	HOV	2.4	2.0
	Transit	4.6	4.2
	Total	2.1	2.3
High income	SOV	1.9	2.1
	HOV	3.1	2.2
	Transit	4.9	4.4
	Total	2.7	2.6

[10] Working Paper 10 – The Effects of Peak Period Pricing on Proposed Highways in the Portland Metropolitan Area, September 2000, Metro

Table 7: Vehicle cost savings in year 2020 by income group and travel mode relative to base cost[11]

		Vehicle cost savings relative to base cost (%)	
		Pricing alternative	
Income class	Travel mode	RTP: peak pricing	RTP: conventional
All classes	SOV	0.2	(1.6)
	HOV	(1.4)	(0.8)
	Transit	-	-
	Total	(1.4)	(0.8)
Low income	SOV	4.5	(1.8)
	HOV	(3.4)	(0.9)
	Transit	-	-
	Total	1.6	(1.1)
Middle income	SOV	(0.5)	(1.7)
	HOV	(1.0)	(0.9)
	Transit	-	-
	Total	(0.5)	(1.2)
High income	SOV	(0.7)	(1.5)
	HOV	(0.9)	(0.6)
	Transit	-	-
	Total	(0.6)	(1.1)

[11] Working Paper 10 – The Effects of Peak Period Pricing on Proposed Highways in the Portland Metropolitan Area, September 2000, Metro

Consistency with land-use and transportation plans and policies

Lesson learned: **In general, the pricing options support regional transportation policies and plans. Mobility is enhanced, freight movement is benefited and vehicle miles traveled (VMT) are reduced in comparison to options with the same capacity that are not peak period priced. Land-use impacts need further study.**

Following are the tables from Working Papers 9 and 10 respectively which show the evaluation by option. The results are discussed following it.

Table 8: Overall consistency with regional and local transportation and land-use plans

Option	Mobility improvement measure	Freight movement (on freight network) measure	Accessibility (from regional centers and industrial areas) measure	Overall consistency with transportation and land-use plans
A I-5S, reversible	++	⊙	⊙	⊙
B I-5S, whole	++	+	-	⊙
C I-5N, corridor	++	+	-	⊙
D I-84, whole	++	+	⊙	+
E Hwy 26, partial	+	⊙	⊙	⊙
F Hwy 217, partial	++	+	⊙	+
G McLoughlin, partial	+	⊙	⊙	⊙
H Hwy 43, spot	+	-	-	-
Weighted at:	25%	25%	50%	

Table 9: Overall consistency with regional transportation plans and policies (all measures are for one-hour PM peak)

Alternative	Mobility (average speed on new lanes)	Overall congestion (vhd in travel sheds)	VMT per capita (regionwide)	Mode split (% of SOV in travel sheds)	Overall consistency with transportation plans and policies
RTP: conventional fees	33.3 mph	11,847 hours	15.7	71.7%	⊙
RTP: peak period pricing	46.3 mph	11,210 hours	15.4	71.0%	+
Difference (peak pricing – conventional)	13.0 mph	-637.0 hours	-0.3	-0.7%	
Weighted at	25%	25%	25%	25%	

Performance ratings:
+ + positive
+ slightly positive
⊙ neutral
- slightly negative
- - negative

Mobility

The detailed review of eight options in Working Paper 9 revealed significant mobility enhancements from pricing.

Speeds on priced lanes were 30-70 percent faster after pricing. Pricing reduced the travel time to drive the full length of the facility by between 4 and 11 minutes. These mobility improvements are underestimated by Metro's travel. The model assumes that no cars travel above the speed limit, which puts a cap on potential speed and travel time benefits from pricing.

Since some of the options in Working Paper 9 included new capacity that was not provided in the base, the regional analysis in Working Paper 10 is instructive in disaggregating the effects of new capacity and pricing. In Working Paper 10, two alternatives with the same amount of new capacity – one funded with peak period pricing and the other using conventional fees – were evaluated. The results are consistent with those of Working Paper 9. Speeds on priced lanes were 40 percent better than conventional lanes during the p.m. peak period.

Lesson learned: **Peak period pricing appears to consistently provide a more reliable mobility alternative than traditional lanes.**

Overall congestion and diversion onto alternative routes are addressed in neighborhood effects.

Land use

Lesson learned: **Definitive understanding of the land-use effects of pricing must wait until better land-use models are available.**

In the detailed review of eight options, most options had only insignificant effects on household accessibility to key destinations in the land-use plan. However, a few of the more comprehensive options (B, C and H) had slightly negative effects on access to regional centers. This result suggests further consideration of the potential for harm to key destination from pricing of existing facilities.

The regional analysis, where only new facilities were priced, was inconclusive. The changes in accessibility of households to regional centers as a result of peak period pricing appears to be insignificant and the effects are inconsistent (e.g., some options showed improved access while others showed slight reductions). Further, since only auto access was evaluated, it may be that any negative effects are compensated for by enhanced transit. A combined measure that accounts for auto and transit use would need to be developed and the results evaluated in order to provide a more meaningful evaluation of land-use effects with existing models.

Freight

Lesson learned: **Working Paper 9 demonstrates that pricing is attractive to trucks and can be used to manage the flow of truck traffic.**

The proportion of trucks on the freight network increased after pricing because major highways were priced and attracted truck traffic from arterials. It was assumed that heavy-duty trucks were

not allowed on the single lane options for modeling purposes. A decision as to whether trucks will be permitted on particular facilities will be made on a case-by-case basis in future analyses.

The regional analysis showed that light-duty trucks enjoyed a 5 percent increase in net benefits relative to base costs under peak period pricing. This result is higher than that for conventional funding of the same facility improvements. In the regional analysis, heavy-duty trucks were assumed to be barred from all new facilities except the I-5 bridge. As a result, peak period pricing was neutral as to heavy-duty trucks. In any situation, the benefits to trucks needs to be balanced against the potential disruption to other traffic.

Lesson learned: **Due to the significant potential benefits to trucks, it is important to consider allowing them on facilities to the extent that it won't detract from facility operations.**

Vehicle miles traveled

Lesson learned: **The detailed review of eight options demonstrates that, where existing capacity is priced, pricing generally reduces VMT.**

The options where existing capacity is priced reduced VMT by between .1 and .6 percent, which is fairly significant given the fact that only short sections of highway were priced in each case. Two options (A and H) where no new capacity was added increased VMT by .3 and .4 percent. However, these options were found to have created a lot of diversion onto already congested routes and cause out of direction travel. This evaluation measure was not used in the final composite score because some of the options added capacity over the base. The new capacity induced greater travel and since the capacity was not in the baseline its impossible to separate out the effect of pricing from the effect of the new capacity. The results are presented fully in Table 17 of Working Paper 9.

In the regional analysis, two alternatives with the same amount of new capacity were modeled. One was paid for via the gas tax and the other via peak period pricing. Both options increase VMT over the base, but the per capita increase under peak period pricing increase was 1.6 percent less than that of conventional lanes. Thus, if new highway projects are needed, pricing can hold down VMT per capital and help achieve VMT reduction goals.

Mode shift

Lesson learned: **Peak period pricing has the potential to produce significant mode shifts.**

While significant mode shifts were found in the detailed evaluation of eight options, these were not used to evaluate the options because transit was added to each option over the base. The regional analysis separates out the pricing effect because the same transit additions were included in both alternatives. One would expect transit mode share to increase in both alternatives, which turned out not to be the case. Conventional fees had a neutral effect on mode share while peak period pricing reduced region-wide SOV share from 71.7 percent to 71.0 percent. This .7 percent reduction in SOV share represents a 1 percent change, which is significant given that only new lanes were priced.

Societal effects

Environmental effects

Lesson learned: **Where new capacity must be added, peak period pricing appears to be a preferable approach from an air quality standpoint.**

The air quality effects appear to be tied to the VMT and whether new capacity is provided. In the detailed review of eight options, the options that priced existing capacity reduced VMT and had positive effects on AQ. Because not all of the capacity was included in the base in this round, it was not that useful for evaluating partial facilities.

The regional analysis separates out the pricing effect because capacity is held constant between the two alternatives. Since both alternatives add new capacity, both increase VMT and would be expected to degrade air quality to some degree. However, peak period pricing minimizes the negative effects. Improved speeds overcame the VMT increases and resulted in reduced CO, HC and WC in both alternatives. Both alternatives increase NOX. The NOX increase is expected to produce more ozone, which the primary air quality concern in this region. The increase is considered slightly significant for peak period pricing and significant for conventional fees. The NOX increase under conventional fees is three times that under peak period pricing.

Lesson learned: **Peak period pricing produces positive energy impacts even when capacity is added.**

While energy use increases in the conventional fee scenario, peak period pricing would be equivalent to removing 800 cars per year from the road in terms of energy use.

Neighborhood effects

Lesson learned: **Whole facilities or even corridor pricing, where there are viable unpriced alternatives, result in diversion of significant amounts of traffic onto arterials.**

As an example, the one corridor option, I-5N, priced the highway and what we thought were the main parallel arterials. However, we ended up having to rerun the analysis because the model showed several hundred vehicles per hour diverting to a parallel arterial that was not considered as good and was at least a mile from the highway via an upriced route. We ended up having to toll that route as well. In the detailed review of eight options, options where new capacity is priced, on the other hand, drew traffic from the arterials onto the highway.

Traffic diversion is not expected when new capacity is added. The regional analysis, which compared priced and unpriced new capacity, confirmed this hypothesis. Congestion within priced corridors, in general, was reduced overall compared to a base without the new capacity. Peak period pricing actually reduced congestion within the corridor in comparison to an alternative that added the same capacity but did not price it.

Public acceptance

Peak period pricing faces a lot of resistance among the general public, however, people are much more willing to consider tolling if it involves new capacity and/or a non-tolling choice remains.

In the initial round, the public acceptance measure assessed the option on the degree of choice and whether it offered new capacity. The detailed review scored each option on five key issues: choice, new capacity, perceived need, equity and impact on neighborhoods. These were weighted according to the level of public concern/feedback. Alternatives that increased choice (such as those that added capacity and/or only priced a single lane) scored much higher in terms of public acceptance. The perception that the project was solving a real problem was next in importance to the public.

4.0 Public Involvement Activities

4.1 Overview

The Traffic Relief Options Study included both technical and public involvement components. This section focuses on the extensive three-year public outreach effort that supported and enhanced the technical work, and the findings and lessons learned as a result of this work.

Early research conducted on the outreach programs of other cities confirmed that peak period pricing is a complex and controversial idea to convey and that substantial time is required to explain it. For this reason the study opted to depart from a traditional public involvement outreach strategy that tends to communicate a single message to a broad public in an effort to reach the greatest number of people possible. Instead, the approach for the first year of the study was to build awareness of the project gradually by selecting targeted audiences, attempting to provide a more detailed discussion of the issue and progressively building from an informed citizen foundation. In addition, other studies recommended that we go to the general public only with a short list of projects with specific benefits.

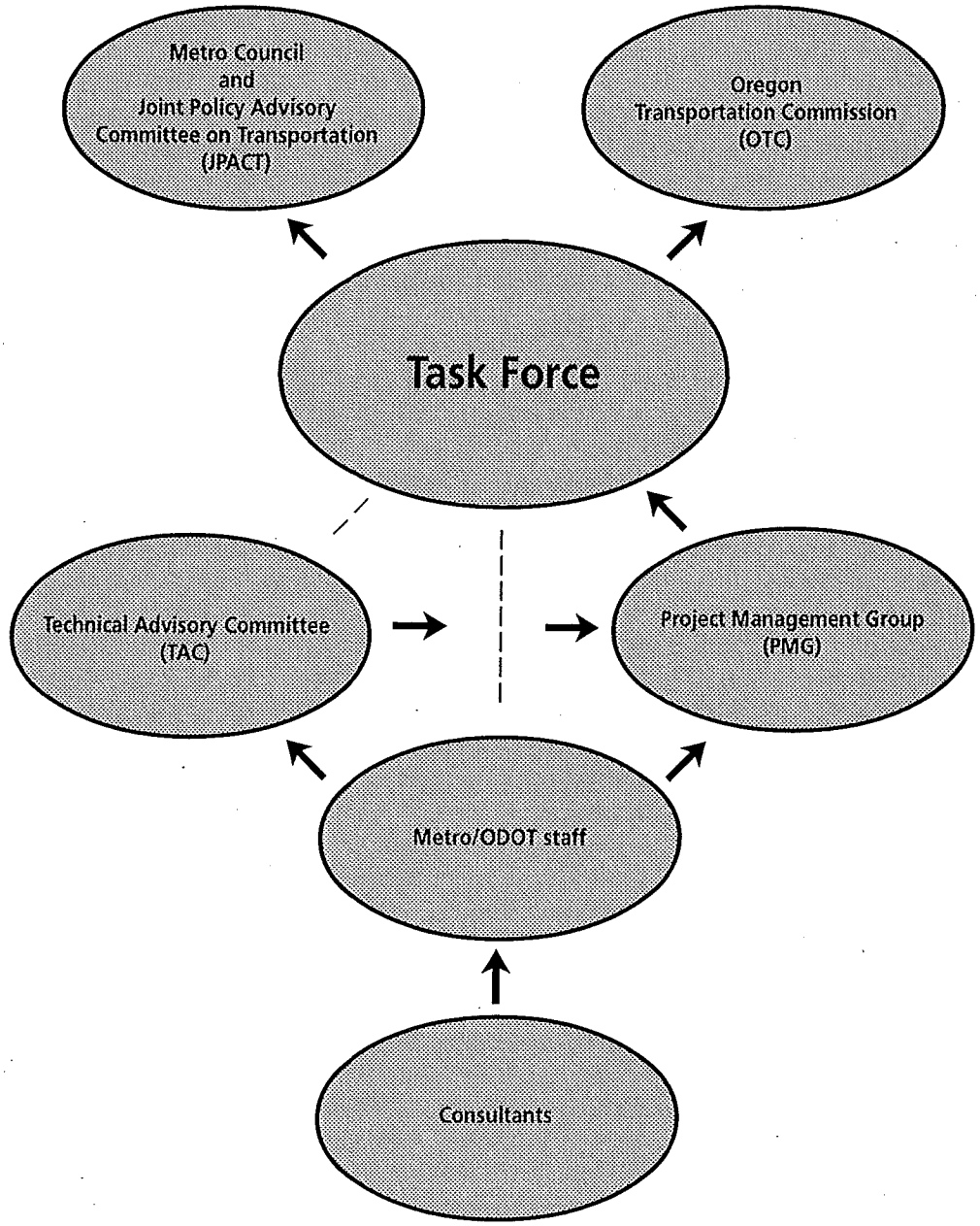
Public involvement efforts focused, first on communicating with targeted interest groups such as business members, the trucking industry, social service organizations, elected officials and representatives of the media. Later efforts in the second and third years of the study reached out to a broader segment of the general public. This was accomplished through workshops held in concert with Metro's regional transportation planning effort, media, newsletters and increased speaker's bureau activity.

Thus, for the study, meetings and workshops were designed to allow sufficient time to present the complex and little-known concept of pricing, garnering input from groups of participants and slowly expanding the field of informed residents. As a result, at each stage of the technical analysis, the participants provided important direction to the study.

4.2 Committee structure

The committee structure of the study consisted of policy and technical review bodies. It was organized so that information and feedback would flow up and down the communication ladder through the various groups. (See organizational chart.) In general, this configuration worked effectively, as it mirrors Metro's successful and well-used regional transportation decision-making model.

Figure 2: Traffic Relief Options Study organizational structure



Note: Direction arrows indicate primary direction of information/recommendation but are not meant to exclude feedback.

4.2.1 Study review committees

Task Force

The Task Force, the highest-level project committee, was an independent group of long-range thinkers who would have an interest in this topic but no preconceived bias. They were charged with giving serious consideration to the topic of congestion pricing. The role of Task Force members was to consider input from the Technical Advisory Committee, Project Management Group and the public at key decision points, and to provide reports and recommendations to the governing bodies – Joint Policy Advisory Committee on Transportation, the Metro Council and the Oregon Transportation Commission. Members also functioned as key spokespeople for the study. The group reviewed all significant decisions and interim and final work products for both the technical and public involvement work.

The Task Force was designed as a citizen body because it was thought that a study this controversial would need strong public acceptance. A citizen committee was thought to provide an independent and credible community voice that would help in achieving greater public and political understanding of the topic.

Based on research and experience, it was concluded that the Task Force would need to be small enough to operate as a working committee and yet inclusive of representatives from all sectors of the community. This unique mosaic of men and women consisted of a newspaper owner, the urban league director, high-tech and communication industry representatives, elected officials, an academic and small business owners. The 15-member group also included the chair of the OTC and Metro's Executive Director, who both acted ex-officio.

The Task Force met monthly from July 1996 through June 1999. All of its meetings were open to the public with a portion of the agenda set aside for public comment.

Project Management Group (PMG)

The Project Management Group was a collaborative body where policy issues could be worked through before they moved to the next step in the decision-making process. The PMG was comprised of director-level staff from the jurisdictions and key agencies involved in the study. It provided information and recommendations to the Task Force and received information and recommendations from the TAC and Metro and ODOT staff. The PMG met only around key decision points, approximately two to four times a year.

Technical Advisory Committee (TAC)

The Technical Advisory Committee was comprised of technical staff from jurisdictions, key agencies, representatives of environmental and trucking not-for-profit groups, the consultant to FHWA on the pilot program and an interested resident. This group generally met twice a month throughout the study to provide detailed input into all aspects of the work program. The TAC reviewed all reports and working papers prior to submission to the Task Force and other committees. It provided input to the PMG and the Task Force.

4.2.2 Regional and staff review committees

Joint Policy Advisory Committee on Transportation (JPACT)

JPACT is a unique body that serves as the policy committee for the Metropolitan Planning Organization and also has a direct relationship to the Metro Council. The 17-member committee composed of elected officials and representatives of agencies involved in transportation recommends priorities and develops the transportation plans, projects and programs for the region. Actions proposed by the Task Force at key milestones were directed to JPACT for consideration. The recommendations were then forwarded to the Metro Council, which must adopt JPACT's recommendations before they become the transportation policies of the metropolitan region.

The Metro Council

The Metro Council is composed of seven members elected from districts throughout the tri-county metropolitan area. The council heard testimony from the public on the TRO Study and considered and approved the JPACT recommendations regarding the study.

The Oregon Transportation Commission (OTC)

The Oregon Transportation Commission oversees the Oregon Department of Transportation. The OTC and the Metro Council reviewed the recommendations made by the TRO Task Force.

4.3 Outreach methods and materials

4.3.1 Public outreach materials produced throughout the project

Both traditional and nontraditional forms of outreach materials were produced and used to educate the public and the media on this study. Newsletters, fact sheets, news releases and reports were written and distributed in a conventional manner, alongside information developed to be conveniently available on a 24-hour basis with the use of a telephone or a computer with access to the Web.

Newsletters and fact sheets. Newsletters and fact sheets describing key aspects and decision points of the study were distributed to interested parties, agencies and at public gatherings around the region.

Reports. Reports were produced after speaker's bureau engagements, stakeholder interviews, focus group sessions, and focused and community workshops. Compendiums of these reports and any other record of public comment received by the study were periodically produced in the form of public comment reports.

Piggyback information. In an effort to stretch resources, increase attendance at meetings and expand outreach, attempts were made to piggyback TRO information with other transportation related public outreach efforts whenever possible. This included partnering with the Regional

Transportation Plan on community workshops, sharing ads in newspapers, placing articles in community newsletters and distributing newsletters and fact sheets at transportation meetings/ fairs.

Briefings and news releases. Briefings and news releases were provided to the staff of local newspapers, resulting in numerous stories in local newspapers, radio and television news shows.

Examples of the written reports, fact sheets and newsletters are contained in the public outreach appendix.

4.3.2 Nontraditional forms of outreach

Recognizing that the majority of residents will not participate in meetings and workshops, attention was given to communication methods that would provide readily accessible information on a 24-hour basis. Nontraditional interactive forms of outreach were developed and used for this study in an effort to capture input from people who might not ordinarily participate in conventional forms of public outreach activities.

Project hotline. A 24-hour project hotline allowed callers to access information about the study, leave comments and request information.

Project web page. A web page was set up with information about the study, an online questionnaire and e-mail box that was available on a 24-hour basis.

Oregonian Inside Line. Individuals could learn about the study and leave comments on a 24-hour basis, via a series of recorded information messages maintained by The Oregonian, the regional daily newspaper.

Traveling exhibit. Information about the study was included in a traveling transportation exhibit in the form of a narrated TRO slide show, information panels, interactive computers complete with questionnaire, and newsletters and fact sheets. This exhibit traveled to such nontraditional locations as county fairs, shopping malls, large community gatherings and concerts as a way to expose individuals of all age groups and backgrounds to the study in a relaxed nontechnical venue.

4.3.3 Tools used in support of the narrowing process

During each evaluation stage of the TRO Study, a comprehensive and continuous outreach process was used to analyze a full range of peak period pricing options. Peak period pricing was described as one of a range of tools within the regional congestion management toolbox that could be considered alongside existing strategies that were already implemented to a greater or lesser degree in the region. To demonstrate how this concept would fit within the existing fabric of the transportation system, peak period pricing was discussed within the context and language of the RTP, the 20-year transportation blueprint for the metropolitan area.

Residents had the opportunity to review the study's progress and express their opinions on the peak period pricing options in a multitude of ways, and at a variety of forums, as is reflected by the following summary of activities and events.

Stakeholder interviews. Two rounds of interviews were conducted, one in 1996 and the other in 1998. The first round of 30 interviews included business leaders, elected officials, local government staff, community, transportation and interest group representatives. Their opinions were sought regarding the potential impacts and benefits of tolling, and on the obstacles to implementing a project. In 1998, 27 interviews were conducted with the same interest groups represented as in the first round and, in some cases, the same people. The object of this round was to ascertain participants' views about peak period pricing, including the general concept and study approach, specific options, potential use of revenues, and how to continue to involve the public.

Focus groups. Two sets of focus groups comprised of men and women of mixed ages and occupations were held in 1996 and 1997. In the earlier round, one group represented the general population and the second group represented users of the major corridors during peak hours. The focus groups were designed to qualitatively explore the range of attitudes regarding tolling, and gain insight into the motivations underlying these attitudes. Information gleaned from the first round was used to identify issues that would help frame messages, and define study options. In the 1997 round, more participants supported the project than in the earlier round. It is not known for certain why this was the case, but it's possible that providing more specific information about potential pricing options and the tone and content of the slide show could have been contributing factors. The focus groups proved to be extremely helpful in pointing out holes in our information, identifying concerns related to tolling and suggesting how to address them.

Targeted workshops. In the winter of 1996, five targeted workshops were held with representatives of community, transportation, business, environmental and social service groups. Participants were provided information about the study, and their opinions were solicited about the project to date and its future direction. Participants commented on the concept of peak period pricing, the types of projects to be studied and the proposed evaluation criteria. Participants received a questionnaire providing a field of congested areas in the Metro region identified as possible study candidates and made suggestions about the locations.

Regional workshops. Six regional workshops were offered to the general public in the fall of 1997. The first half of these two-part workshops consisted of a presentation on the Regional Transportation Plan, and the second part focused on the TRO Study. TRO workshop participants watched a slide show, engaged in small group facilitated discussions and filled out a questionnaire. While in the small groups, participants selected three TRO options they wanted to discuss, gave opinions about the advantages and disadvantages of each, reviewed the evaluation criteria used to compare the options and suggested possible uses of toll revenues. The two projects shared the considerable cost of the workshops themselves, and the advertising in newsletters and newspapers. The turnout was small in proportion to the amount of advertising, materials, and staff and consultant time required for the workshops.

Questionnaires. Approximately 200 project questionnaires were collected beginning in 1997 at public workshops, at some speaker's bureau presentations, on the traveling exhibit, and from the project web page to capture opinions about the project in general and the specific options being studied. The questionnaire was not constructed as a bona fide scientific instrument but did provide qualitative information that was compiled and ranked for purposes of comparison. People at speaker's bureau engagements or public workshops had the benefit of a peak period pricing presentation prior to answering the questionnaire. Those who answered it on the web or on the traveling exhibit may or may not have read accompanying information about the study and could have answered it from an uninformed position.

Freight workshop. A freight workshop in spring of 1998 opened dialogue between project staff and local and regional haulers regarding congestion and the pricing of roads. Of the 41 freight industry representatives invited to the workshop, 18 attended. The workshop included a TRO presentation and slide show, discussion of issues and a questionnaire. Information received from this group included the degree of truckers' willingness to pay for specific time savings, reasons for using priced facilities, opinions on specific options, advantages and disadvantages of peak period pricing and recommended uses for toll revenues. This workshop was extremely valuable in reaching a group that does not often participate in transportation studies but is a key stakeholder. The participants came to the workshop with misconceptions about the study, but judging from the tone and substance of the discussion, many of them appeared to view the study more positively by the end of the meeting.

Speakers' bureau. More than 60 speakers' bureau presentations were provided to city councils, chambers of commerce, neighborhood associations and other civic groups. Participants received a slide show presentation, asked questions and expressed their views on the study. Each presentation required a good deal of staff time to schedule the interest group and match the appropriate Task Force member as the speaker and TAC member or Metro staff representative as the assistant. In general, the formula of matching a Task Force member with a like interest group, presenting a slide show and following it with a candid question and answer period proved to be a very effective way to obtain the time to educate fairly large numbers of people and receive input on the study.

News stories. Three rounds of news stories were distributed to organizational and community newsletters throughout the region. News stories were provided to a large list of newsletters that resulted in articles about the study. This was an inexpensive way to disseminate accurate information about the study to a relatively large group of people.

Media briefings. During the life of the study, more than 15 briefings to reporters and editorial staff of local newspapers were held, resulting in several stories in local newspapers, radio and television news shows about the study. This is a key way to provide accurate information about the study to the news community, reduce rumor mill activity and to keep the project in front of the media.

4.4 Findings and lessons learned

It is important to note when reading this section, that the public outreach, while extensive, produced primarily anecdotal and qualitative information. Thus the findings and lessons learned depart from those offered in the balance of this report, which are primarily based on objective and quantitative data.

The themes and comments gleaned from research, workshops, focus groups, meetings and questionnaires remained consistent during the three years of the study. Those most frequently heard are included in the following:

- Lesson learned: **In the current political climate in the Portland area, any successful pricing project must offer alternatives to motorists between the choice of paying for express service lanes or use of lanes at no cost.**

  We consistently found from public outreach activities such as focus groups, targeted workshops and speaker's bureau presentations that choice is a key issue. Support for a project appeared to hinge on whether motorists were given a choice between paying for better service or using existing lanes for free. People want the choice to avoid the extra cost of a toll, since their choices of where to live and where and when to work are probably fixed in the short term.

- Lesson learned: **When naming a project that is controversial in nature, much thought should be put into what the name would convey to the public. It should be positive, clear and not require a great deal of explanation.**

  The original name for the study, ("congestion pricing"), was perceived as a double negative and not descriptive of this relatively unknown controversial concept. The Task Force chair led a small work group, which came up with the name and tagline: Traffic Relief Options – Peak Period Pricing Incentives to Relieve Congestion.

- Lesson learned: **Through experience, we found that a defined project is necessary in order to engage large portions of the community. Once the parameters of a controversial project are determined and defined, the size of the population interested in the study will grow commensurately. At that point it is important to talk at length with people who are impacted and provide the education and information needed to facilitate an evenhanded discussion.**

  When a study is a largely academic and theoretical conversation about a complex controversial concept applied in several locations, it is difficult to engage the general public and elected officials in dialog as there is no real or specific example or any defined community impacts to "hook" interest. As an example of this, we mailed approximately 50 letters to state legislators offering a personal briefing on the TRO study, and even after a follow up call, not one individual requested a briefing. It seemed not to be an imminent issue, so it did not rank high as a priority. As the options became better defined, user groups and groups in areas adjacent to the facility became more interested in the study.

- Lesson learned: **A study should set up a quick response team early in the process – cultivating "on call" credible spokespersons with ties to the community are helpful in responding to media requests in a timely manner.**

  The Task Force functioned effectively and successfully as credible spokespeople for the study at scheduled speakers' bureau engagements and other events. However, they were often not easily accessible or briefed on the latest message when we needed someone to talk to the media. In retrospect, we should have set up a quick response team to answer media inquiries that required immediate attention.

- Lesson learned: **Identify committed, credible and accessible project champions who are respected by the community at large, and would willingly be seen as representatives of the project.**

  During public involvement strategy meetings with our strategic advisory panel, the idea of a project champion emerged. In addition to the Task Force, it was thought that a project champion (who could be a Task Force member as well) would be a useful asset to our controversial study. The description of desired traits of our archetypal champion would include someone respected by the community at large who can stay above the fray, not be politically endangered by supporting the project nor seen as an agency mouthpiece.

- Lesson learned: **A successful tolling project will need to include an extensive public outreach component that provides opportunities for in-depth give and take dialogue on peak period pricing.**

  Following in-depth give-and-take dialogues, such as stakeholder interviews, focus group or speakers' bureau presentations, residents are often neutral to supportive regarding the notion of peak period pricing. On the other hand, superficial exposure to the concept, such as TV polls or questionnaires without the accompaniment of discussion, would often result in a negative, knee-jerk response.

- Lesson learned: **We need to educate planning professionals to understand that peak period pricing is a tool that can relieve congestion while still maintaining compact patterns of development.**

  Some planners perceive that regional plans and policies assume a certain level of congestion. Congestion may be viewed as inherent in a more compact pattern of development. Claims that peak period pricing can reduce congestion, therefore, may be challenged by planners who have not been exposed to the concept.

- Lesson learned: **The Task Force concluded from information garnered through public outreach that, in the current political climate in Portland, any successful pricing project must only toll added or new capacity.**

  Through public outreach activities, such as stakeholder interviews, focus groups and speakers' bureau presentations, we found that tolling added capacity or new lanes is preferable to most people rather than tolling existing lanes on a facility. Tolling of existing lanes is seen as double taxation because the perception is that they were already paid for through gas taxes.

When capacity is added, it tends to be viewed as a benefit, so the perception is that you are getting something for your money.

- Lesson learned: **In discussions and printed materials, it needs to be said up front and repeatedly that toll collection will be fast and convenient. Through the use of a transponder or other electronic device, a vehicle will not even have to slow down to pay a toll. Instead, the fee will automatically be deducted from a prepaid account.**

  The public assumes that conventional tollbooths will be used to collect tolls and that this will exacerbate existing congestion.

- Lesson learned: **Privacy may be less of an issue than anticipated. However, any study should be ready with workable suggestions to address concerns such as by providing blind accounts, and allowing the anonymous use of the system.**

  Although privacy was reported to be an issue in other regions where congestion pricing is being studied, and it was raised in focus groups conducted early in the study, it never rose to the top as a major concern as the study progressed. Also in other locations where peak period pricing has been implemented (California, Texas) privacy has evaporated as an issue once facilities open.

- Lesson learned: **Diversion needs to be addressed by any study or implementation. Neighborhoods adjacent to a project must be shown either that traffic won't be diverted or that steps could be taken to ensure reasonable protection from intrusion.**

  Traffic diversion into neighborhoods and onto parallel arterials continued to be a large sensitive issue throughout the study even though there was not a specific project being discussed. It is an issue that people have experience with and can extrapolate from their previous experiences to a given tolling project.

- Lesson learned: **An enforcement plan needs to be developed and described up front for any tolling facility.**

  A question the public repeatedly asked was how and who would enforce the prescribed use of a tolled facility. People want to know how the technology works – they were skeptical that the system could be sensitive enough to detect and deal differently with carpools that would probably be charged a lesser or no toll, out-of-state visitors uninitiated in the rules of the facility and deliberate cheaters. The underlying feeling expressed was: "If I buy into this idea and pay my share, then anyone cheating the system needs to be caught and penalized."

- Lesson learned: **Equity issues need to be addressed as soon as possible and researched in great detail. Solutions proposed in other areas, such as rebates to low-income drivers or tax credits to users, may not be publicly supported in this region, and other mitigation measures should be explored. This may be an appropriate topic for public opinion research.**

  Equity continued to be an important issue throughout the study. It was raised in the context of impacts on low-income residents, as well as those with little choice of how or when they

travel. However, even given equity concerns, most people did not favor using revenues for rebates to low-income drivers or tax credits for people who use priced facilities. This issue can also be raised for political reasons by those who are generally antagonistic to pricing but wish to disguise their opposition under the veil of equity.

- Lesson learned: **The freight community is an important player – ally or opponent – of congestion pricing and needs to be carefully cultivated. It should be brought to the table early in a study. It is also important to quantify the impact of congestion on freight and other businesses and the potential of peak period pricing to reduce congestion during rush hours.**

  Research from other studies has shown that the freight community is not always included in conversations about congestion pricing, even where freight interests have a significant stake in how congestion is managed. This is particularly important, given the increasingly time-sensitive nature of most freight delivery. At a freight workshop in Portland, there was general consensus by participants that serious congestion in the region affects freight traffic. Even so, there was a lot of misinformation about the goals and purposes of the study at the beginning of the meeting. By the end of the meeting, although there was no general agreement among workshop participants that pricing was the answer to managing congestion, there was some willingness voiced to pay to avoid delays and meet pickup and delivery schedules.

- Lesson learned: **To cut through the confusion and controversy that this topic engenders, it is important to carefully distill the project message into a few lines that are consistent, straightforward and easy to understand.**

  The public and TAC commented on the importance of clearly defining the study's objectives, and clarifying whether the purpose of peak period pricing was to raise revenues or manage congestion. At the beginning of the study, the focus was on congestion management, but financing needs came to fore later. When presentations were made to interest groups, the message sometimes changed to fit the philosophy of the group being addressed by the TRO speaker.

- Lesson learned: **Before embarking on a peak period pricing project, there must be general agreement in the region, or corridor, that congestion is a serious problem and there must be understanding of the issue to make educated decisions. This may be an area that could be assessed with early public opinion research.**

  We found from our focus groups and other outreach activities that congestion in the Portland region is considered a serious to very serious problem. Yet, we also heard from people who came from other parts of the US that congestion is not a crisis in the Portland area. Many people suggested that we should try other approaches before pricing. Congestion is not an absolute, and is experienced subjectively by the user of a facility.

- Lesson learned: **It is important to be clear up front about the use of revenues. It is best if they can be committed to specific projects on or near the tolled facility. Surveys may be helpful in selecting the project and uses.**

  Studies in other cities and in Portland have indicated that public acceptance depends, in part, on how revenues are to be used. People do not trust the government and react negatively if they feel a revenue grab is being made. From workshop participants we found that people strongly prefer using revenues for operation and maintenance of a priced facility and/or improvements on or near the facility. Beyond that, there was no clear agreement about whether money for improvements should be spent on new lanes or roads, or for bicycles, pedestrian or transit improvements.

- Lesson learned: **It is important to carefully select, develop and train citizen representatives to speak in the community on behalf of a controversial pricing study.**

  Residents are leery about information provided by government agencies. Thus, Task Force members, who immediately convey objectivity and engender a sense of trust, especially among their peers, were scheduled around the community to represent and speak about the study. They were seen as credible messengers of this controversial idea.

- Lesson learned: **A media strategy should be in place for any study. Briefings should be scheduled, materials in news releases should be concise and current, and a staff and non-staff contact should be accessible at any time to provide information and a link to the project. Press relationships are critical, and even when news releases are issued, lead staff are briefed and project staff remain accessible and responsive to reporters, it should not be forgotten that peak period pricing is a volatile subject waiting for a sound bite.**

  The importance of the media should not be underestimated. It provides a crucial connection to the entire region, and the relationship needs to be tended and nurtured. It is a priceless way to keep a project in the public's eye and give an idea an airing. We had a detailed media strategy that called for outreach on a regular basis. In general, this put us in good stead with the press. Nonetheless, we were subjected to one round of negative coverage as the result of an unexpected article, which contained misleading information.

- Lesson learned: **It is important to develop a clear message especially when the concept under consideration is relatively unknown and potentially controversial. This is particularly difficult when a broad range of types of pricing – some of them unacceptable to the public – are being considered. Focus groups and stakeholder interviews can be helpful in message development and definition.**

  We learned from focus groups and through experience that a clear project message is very important to develop early in the process. We had a difficult project message to hone that sometimes created problems with media sensationalism.

- Lesson learned: **When engaging in conversation about a tolling project with the public it is important to put it in the context of the other traffic management tools that are being considered or already in place in the region or specific corridor. These other tools and strategies should also be discussed in the materials written about the project.**

  We heard from the public that the development of other alternatives to tolling was imperative. People wanted to know that other measures were being considered by government in addition to tolling, such as encouraging employers to allow flextime, carpools, and building bike routes. We received many comments to the effect that positive incentives should be pursued first.

- Lesson learned: **It is important to research local conditions and gauge the current political climate through interviews, focus groups or surveys before launching into a complex study of this sort that has the potential to be steeped in controversy. On the other hand, a credible study with even limited official support can go a long way in educating locally elected decision-makers and other stakeholders on this issue.**

  The approach or strategy selected to provide public outreach for congestion pricing depends upon several variables including the economic health of the region, gas prices, perception of congestion, the political will of the electorate and those they elect, and demands of competing public policy issues and initiatives. We learned through outreach activities that congestion is a growing concern to most people. However, due to the recall of politicians, being in an election cycle and growing anti-government sentiments, there was, at times, a lack of political will to support this controversial concept. When the study began, the time was not yet ripe for this proposal. Today, three years later, any major new transportation project in the metro region must study pricing as a an alternative.

- Lesson learned: **The opportunity to have intensive interaction with interested residents and the high quality of information achieved through workshops is extremely helpful in this kind of study. However, a study with a small public involvement budget may not be able to expend resources on this type of cost and labor intensive outreach tool. If workshops are undertaken, serious consideration should be given to techniques, such as partnering with major civic groups, to increase attendance.**

  Resource expenditures for the six regional workshops were considerable. It was our experience that meetings of this sort require room rental, security and janitorial staff, refreshments, advertising in newspapers, postage for invitations, maps and other graphics, materials, and staff and consultant time. Also, in an effort to further stimulate attendance numbers, staff phoned people on interested citizen lists to remind them personally of the workshops and encouraged them to attend. In the final analysis, although the quality of the information garnered at the six workshops was good, the turnout was small in proportion to the amount of time, effort, logistics and funds required to successfully produce them. In future, we plan to work with other organizations that have large memberships and can draw attendance.

- Lesson learned: **A study should consider using focus groups to help define project options, refine public information and identify issues that will help frame project messages.**

  In our experience, focus groups proved to be extremely useful and cost-effective in pointing out holes in our public information, reviewing and critiquing our slideshow, developing messages, defining options, identifying concerns related to tolling and suggesting how to address them. All of this was achieved in a relatively short period of time with the assistance of a qualified consultant.

- Lesson learned: **A study should use its Task Force or like body as speakers' bureau presenters as a cost-effective way to educate interest groups about the project and garner information from participants.**

  Although speakers' bureau presentations were labor intensive, in general they proved to be a very efficient educational tool. The presentation was usually piggybacked onto the scheduled meeting of an existing civic group. As a result, the presentation was advertised in its newsletter, and the meeting attendees became our participants. Matching a Task Force member with a like interest group was a very effective way to educate small groups of interested people about the complex concept of peak period pricing and to receive input on the study.

5.0 Study Conclusion

5.1 Project outcome/recommendation

The study achieved all four of its initial goals. The Task Force found that, appropriately applied, peak period pricing is a desirable tool to manage congestion and raise revenues in the region. It recommended that peak period pricing be considered whenever major new capacity is added to a limited access highway and that a pilot be undertaken. However, the Task Force concluded that additional corridor level work would be necessary in order to address technical issues and build public support prior to proposing a demonstration project. As a result, the Task Force recommended that additional work should be undertaken and JPACT should identify a pilot within two years. The full text of the study recommendations are included in the technical appendix.

The final Task Force recommendation was based on a review of Working Paper 9, the evaluation of eight options. It was a complex decision process as the Task Force had to decide on overall policy as well as specific project recommendations. After much discussion, the Task Force decided to first outline general policy directions and then determine whether a pilot was to be recommended. This separation helped clarify the issues.

The Task Force was able to come to consensus on the general policy recommendation. There was some debate as to what should be explicitly stated or implied in the language regarding the pricing of existing facilities. One member suggested that we should say that existing roadways were not being proposed for pricing now but that they would be considered in the future. Other members felt that such language would unnecessarily raise the spector of something that may

not come to pass. In the end, the Task Force compromised by stating that pricing of existing facilities would not be proposed "at this time."

A discussion of project specific recommendations commenced. It was clear that members had divergent views of the best partial facility options for implementation and whether any are yet ripe for pricing. A couple of members suggested that further study was needed on a corridor specific level. The concern that selecting a single option without adequate local review could actually hurt chances for implementation was expressed. Emotion was high as members felt that the outcome of three years of work hung in the balance. A couple of members argued that a specific pilot should come out of the study or the effort would have been wasted. In the end, a vote was required. The decision not to recommend a specific pilot project was made by a one vote majority. That recommendation was subsequently confirmed by JPACT and the Metro Council through language that was included in the RTP update.

5.2 Overall lessons learned

- Peak period pricing can provide significant net transportation benefits including travel time savings, reduced travel costs and production of revenues.

- It is important to distinguish the type of benefit when drawing conclusions about peak period pricing. Any study should look at overall societal benefits as well as effects from the public and individual traveler perspectives. We learned:

    - While the more comprehensive types of pricing produce the largest societal benefits, a large portion of these benefits derive from toll revenue. Pricing of existing lanes costs less and produces more public revenue than pricing a single new lane. Pricing of new lanes tends to provide at least as many benefits from the individual users perspective, however.
    - Net traveler benefits are comprised of time savings, changes in costs of tolls and auto operations and ownership. The Task Force and Metro staff question whether we should count the cost savings from reduced auto travel as a true benefit to the individual. Perhaps from the individual's perspective, more travel is better.
    - Benefits from time savings and out-of-pocket costs are larger with partial facilities whereas pricing of existing whole facilities have much more cost savings from reduced auto travel.

- The key to generating revenues is to price a long stretch of congested roadway. The more lanes that are priced and the fewer free alternatives, the more revenues it will generate. On the other hand, it is difficult to fund construction of a new lane based only on toll revenue collected from that lane.

- Public acceptance is essential to serious consideration of peak period pricing. Peak period pricing faces a lot of resistance from the general public. However, people are much more willing to consider tolling if it involves construction of new capacity and/or good non-priced

alternatives remain. In this region, only new facilities or added lanes are proposed for examination as peak period pricing projects in the near term.

- A full evaluation of pricing impacts requires sophisticated modeling tools that can address responses to pricing, mode, time of day, destination and route choice by income.

- The study public outreach approach, which focused primarily on the interested public at the beginning of the study, was largely successful. A variety of tools – including workshops, piggy backing information on other efforts, a speakers bureau and an interactive web page – allowed us to educate a large number of interest groups and stakeholders.

- Prospects for study success can be enhanced by using a study committee structure that allows broad represenation of major groups interested in the study, and provides for information exchange between these groups, the study team, policy interests and sources of technical support.

- The approach of beginning with a broad regionwide review of a large number of pricing options, then narrowing to a small number of specific pricing project options had advantages and limitations. The study team believes that the broad-based review was necessary in the Portland area, given the lack of familiarity with tolling and HOV and the history of tackling controversial issues through the regional planning process. Further, definition of specific pricing options, with modeling results, helped focus the debate. However, this phase of the study consumed more resources than had been anticipated. Also, it was difficult to engage the public in the broad regional study.

- A strong media program should accompany any value pricing study. Briefings should be scheduled, press materials should be concise and current, and staff and non-staff contacts should be available to provide information to the press. It is very important to develop a clear, concise project message early in the process. In addition, a study should set up a "quick response" team cultivating "on call" spokespersons with ties to the community in order to respond to media requests.

- There is a need for project "champions" who are respected by the community at large and would willingly serve as representatives of the project. The public tends to be more receptive to messages coming from non-government task force members. It is important to select, develop, and train spokespersons for the project who will be well-received by the public.

- Focused workshops reaching out to particular groups of interested citizens (e.g., the freight industry) can be a very effective communication tool. It is imporant to quantify the effects of pricing on interested groups.

- It is critical to examine equity and who benefits. All projects appeared to provide more benefits for lower than upper income travelers. However, the original measure did not distinguish type of benefit and mode. Further review demonstrated that:

- The majority of the benefits were coming to transit users. It is important to distinguish the effect of transit from that due to pricing.
- The large transit benefits are the reason low-income travelers appear to do better overall than other groups. However, low-income SOV and HOV travelers did not get as many benefits as those from high and middle incomes.
- Low-income residents did not seem to be bearing the brunt of reduced auto travel due to pricing. The results are mixed, with middle income travelers cutting back as much as low-income drivers in some instances. It is important to evaluate this issue within corridors on a project by project basis to ensure that essential trips are not forgone .
- Middle-and high-income travelers account for most of the increase in HOV travel in options studied. The increase in HOV travel counts as an increase in costs for that class. On the other hand, to the extent that carpooling is a substitute for more expensive SOV trips, an increase in HOV travel can result in a net benefit.

- In sum, it is critical to conduct a detailed review of equity effects for any pricing option. The results are different for each type of pricing. The availability of transit, HOV and other choices are key to whether an option is beneficial for any income group and are the key to insuring that low income individuals share in the benefits of pricing. It may be necessary to consider subsidizing carpooling to open these options to low-income travelers.

- Peak period pricing can be used as a tool to benefit freight travel and manage the impacts of trucking on the rest of the system. Pricing, by providing valuable time savings, can draw trucks, thereby providing financial benefits to the freight industry and moving trucks onto designated truck routes.

- In general, the pricing options support the region's transportation policies and plans. Mobility is enhanced, freight movement is benefited and VMT is reduced where no new capacity is added.

- Tolling enhances air quality, primarily through reducing VMT. However, if an option is adding capacity that otherwise would not be added to the system, VMT increases and air quality is slightly degraded.

- Better tools are needed to properly analyze land-use impacts. Despite the plethora of theories about the effect of pricing on land use, there is little real data in the literature. These effects are important and our analysis suggests the relationship is not straightforward. A land-use/ transportation model is needed to further the discussion.

- As a result of this study, peak period pricing is part of the regional planning lexicon. Peak period pricing is now part of the Regional Transportation Plan for the Portland metropolitan area and must be considered whenever major new highway capacity is added.

5.3 Next steps

The Task Force recommendation was incorporated into the 2000 Regional Transportation Plan for the Portland metropolitan area. In future, all studies to add major highway capacity must consider peak period pricing as an alternative. The peak period pricing requirements are called out both as a general policy and with respect to eight specific highway corridor refinement studies.

On-going studies that have incorporated a peak period pricing alternative include the I-5 Trade Corridor Study, which is examining improvements to I-5 across the Columbia River, and the South Corridor study, which is considering interim improvements to the McLoughlin/Highway 224 Corridor. Several additional corridor studies are currently being considered, each of which would include examination of peak period pricing.

Follow up activities include a final newsletter outlining the entire study process and recommendations. This document is expected to have a shelf life of several years and will be used as an educational tool during the corridor studies. A slide show or other outreach tool that explains how peak period pricing can be used to solve congestion problems and provides guidance for corridor studies attempting to examine this complex issue will also be developed.

6.0 Bibliography of Traffic Relief Options Technical and Public Involvement Reports

All technical and public involvement reports are contained in two appendices, which are being published separately. The contents of the appendices are as follows:

Technical Appendix

Traffic Relief Options Study Task Force recommendations, June 1999

Traffic Relief Options Study preliminary findings, March 1999

Working Paper 1 – Congestion Pricing Implementations to be Addressed in the Traffic Relief Options Study, *July 1996*

Working Paper 2 – Framework for Considering Possible Effects of Congestion Pricing Implementations, *August 1996*

Working Paper 3 – Preliminary Review of Congested Locations and Types of Peak Period Pricing Applications, *November 1996*

Working Paper 4 – Evaluation Criteria and Methods, *November 1996*

A review of area and parking pricing approaches, *March 1997*

Working Paper 6 – Summary – Evaluating 40 Pricing Options and Evaluation of Peak Period Pricing Options, *June 1997*
(Working Paper 5 is incorporated into Working Paper 6)

Working Paper 9 – Executive Summary – Evaluation of Peak Period Pricing Options and Evaluation of Peak Period Pricing Options, *May 10, 1999*
(Working Paper 7 is incorporated into Working Paper 9 and Working Paper 8 is incorporated into Working Paper 9, Appendix D)

Appendix A: Methods and Criteria for Evaluating Pricing Options

Appendix B: Executive Summary from a System of Activity-Based Models for Portland, Oregon: A Demonstration Project for the FHWA Travel Model Improvement

Appendix C: Summary of the Activity Based Demand Model Application for the Traffic Relief Options Study

Appendix D: Cost Estimates for Traffic Relief Options

Working Paper 10 – The Effects of Peak Period Pricing on Proposed Highways in the Portland Metropolitan Area, *September 2000*

Appendix A: Updated Cost Estimates for Traffic Relief Options

Public Involvement Appendix

Workshop summaries, focus group results, public comment reports, newsletters and fact sheets.

1 Survey of Other Congestion Pricing Studies – Summary Report, *September 1996*

2 Public Involvement Research Report, *November 1996*

3 Focus Group Results, *August 1996 (includes Aug. 5 and 6), September 1997*

4 Stakeholder Interviews Summary Reports, *November 1996, October 1998*

5 Targeted Workshops Summary Report, *January 1997 (includes Dec. 3, 4, 5, 10 and 11, 1996)*

6 Peak Period Opportunities Workshops – Summary Report and Questionnaire Summary, *June 1997 (includes June 5, 9 and 12)*

7 Peak Period Pricing Public Workshops – Summary Report and Questionnaire, *December 1997 (includes Nov. 3, 5, 6, 8, 12 and 13)*

8 Freight Targeted Workshop – Summary Report and Questionnaire Summary, *June 1998 (April 24, 1998)*

9 Fact sheets, *summer 1996, summer 1997, fall 1997, summer/fall 1998*

10 Newsletters, *fall/winter 1996-1997, Fall 1997, summer/fall 1998, fall 1999*

11 Public Comment Reports, *June 1996 to December 1997, May 1998 to September 1998, September 1998 to November 1999*