Seattle MIS Executive Summary

Title: Incorporating ITS into Transportation Improvement Planning----- **The Seattle Case Study using PRUEVIIN**

Introduction**:** Transportation alternatives analyses examine the costs and benefits of possible improvements directed at solving a transportation problem. As Intelligent Transportation Systems move into the mainstream, it is important for transportation planners to be able to assess ITS impacts when conducting these analyses.

ITS, by providing improved information to travelers and the ability to adjust traffic control policies in real-time, allows travelers and transportation managers to react to changes in conditions, and to more effectively use transportation capacity. If conditions were always constant, both managers and travelers would learn the best routes, modes, and strategies, and ITS would provide little benefit. However the reality of modern urban travel is that conditions are variable and unpredictable, and that choices based on constant conditions are frequently inefficient. For this reason, traditional approaches to transportation alternatives analysis, which focus on fixed capacities and typical demand, cannot adequately capture the full benefits of ITS.

Project Description**:** Mitretek Systems was tasked by the U.S. Department of Transportation to develop new methods, based on currently available tools, to address this problem. This project explored methods to analyze ITS strategies within Major Investment Study (MIS) studies and to apply them in a case study. The case study developed methods to define alternatives, and to estimate impacts and costs at the level required for a typical MIS effort. Some of the unique aspects of the case study include: (1) a systematic examination of how to incorporate ITS services into MIS alternatives, both alone and in combination with traditional major investment alternatives; (2) development of an integrated framework consisting of both a regional planning model (EMME/2) and a simulation model (INTEGRATION) to capture the full impact of ITS services; (3) development of a set of Arepresentative day@ scenarios to capture non-recurrent conditions and events in the simulation model; (4) and analysis of the complete system represented by the alternatives (ITS plus traditional construction elements).

Approach: Mitretek's *Process for Regional Understanding and EValuation of Integrated ITS Networks (PRUEVIIN)*, a two-level hierarchical modeling approach, is used for this study. At the higher (regional) level, the analysis of overall travel patterns and the system=s response to average/expected conditions is analyzed using a traditional regional planning model. Outputs from this analysis is then fed into a more detailed sub-area simulation model capable of modeling time-varying conditions and demands, as well as individual vehicle-level capabilities and routing decisions. At this level, the detailed traffic operations, queuing, and buildup/dispersion of demand are captured, as well as the real-time response of travelers to information. Feedback is then carried out to ensure that the impacts to expected conditions, estimated in the sub-area model, are reflected in the regional analysis. In theory, one could model the entire region using such a simulation model, but this is not yet practical for desktop PCs and current software.

To account for the variability in the transportation system a unique approach is taken. The weather, travel demand, and accident/incident rate variation are analyzed for the corridor over a period of time. A representative set of scenarios is developed that, when appropriately weighted, can be used to represent an entire year. This step requires a trade-off between adequately capturing the variability in these multiple parameters and still keeping the number of scenarios to a manageable level.

Results To-Date: We have applied this technique to a study of the future congestion problems along the corridor north of downtown Seattle, Washington. This corridor is geographically restricted by Lake Washington and Puget Sound on each side, and is heavily developed, restricting build options. Six alternatives are being analyzed: the baseline no-build case, an ITS only option, highway build options (with and without ITS), and transit enhancements (with and without ITS).

The EMME/2 planning model (macro scale) was used for the regional planning model, and INTEGRATION 1.5 (meso scale) for the detailed simulation model. One of the challenges in the study was to develop expertise in mapping both the inputs and analysis results between the two modeling levels.

Two years of travel demand, weather, and accident/incident data were analyzed; and 30 scenarios developed to reflect these conditions. Each scenario was analyzed in the simulation model for each alternative.

Our initial results confirm the hypothesis that ITS is most beneficial when conditions deviate from the norm. The highest levels of benefits occur in conditions of above average demand and major incidents. In these cases, the information on alternate routes, and the ability of signal systems to respond to changing conditions provide the highest level of benefits to the most travelers.

In all, six alternatives including a baseline were analyzed for the target year of 2020. The ITS Rich alternative contains significant improvements in advanced traveler information services, ATMS surveillance and signal coordination enhancements, transit priority, and incident management. Two traditional construction alternatives were also defined: major improvements to an SOV expressway and a set of HOV plus busway improvements. These were analyzed alone and in combination with the package of ITS Rich improvements. All alternatives were compared to a No Build/TSM Baseline. When comparing ITS Rich to the Baseline, specific corridor impacts include: average daily vehicle throughput increase of 4.3%, annualized delay reduction of 14.6%, reduction in travel time variability by 30%, and reduction in the traveler risk of a significant delay of by 25%. In addition, link based system efficiency measures were also improved. For example, the frequency of slow-speed freeway travel (under 20 kph) was cut by over 40%.

Products**:** Interim Report (methodology), March 1998; Briefing (results from comparison of Baseline vs. ITS-Rich Alternative); Modeling Framework Demonstration (45 min); and Final Report (results from all alternatives), June1999.

Contact**:** For more information on this project contact Donald Roberts (202-863-2976 or dlrobert@mitretek.org) in the ITS Division of Mitretek Systems.