

ABSTRACTS



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UNIVERSITY OF MINNESOTA



CENTER FOR TRANSPORTATION STUDIES

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Rural ITS Safety Solution Systems

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Objective

Develop low-cost, readily deployable, low maintenance systems that can be used by government agencies to improve safety on rural roads and at non-signalized rural intersections.

Methodology

To meet this objective, three systems as described below have been designed and are being tested. The Driver Behavior Evaluation System (DBES) represents an unobtrusive method to monitor driver behavior. It is used to collect traffic volume and speed profile data on approaches to intersections and curves. This data assists the regulating authority in evaluating problem locations and developing the appropriate improvement.

The Stop Sign Warning System provides active real-time supplemental warning to drivers approaching a stop sign at too high a rate of speed.

The Curve Warning System is similar to the Stop Sign Warning System by providing active real-time supplemental warning to drivers approaching a curve at too high a rate of speed.

Findings

At the time of this abstract, the systems have been installed and are operational. By the dates of the conference, evaluation of the effectiveness will be complete.

Potential Applications

These systems are intended for use with relatively low volume (rural) traffic conditions. The speed information gathered will have greater accuracy than that collected by traditional road tubes.

Development and Evaluation of an Advanced LED Warning System for Rural Intersections

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In Minnesota, 70 percent of all intersection-related fatal crashes for the period of 2006 to 2008 occurred at rural, through/stop intersections. The Minnesota Department of Transportation (Mn/DOT) identified improving the design and operation of intersections as a critical emphasis area in the Minnesota Comprehensive Highway Safety Plan. At these intersections, sight restrictions caused by vertical and horizontal curves negatively affect a driver's ability to safely accept a gap in the traffic stream.

This paper presents the result of a two year study on the development of a new intersection warning system referred to as an Advanced Light Emitting Diode (LED) Warning System (ALWS) and evaluation of the system's effectiveness. The ALWS was developed to address the sight restrictions in rural through/stop intersections, and it consists of vehicle detectors that detect approaching or stopped vehicles and LED warning signs that respond according to the received messages from the detectors. The warning signs have LEDs on the perimeter of the sign and a warning message in the middle, which is commonly referred to as a blinker sign. All signs and detectors are powered by solar panels and rechargeable batteries. All message communications between the detectors and warning signs are performed through wireless transceivers.

In order to evaluate this new warning sign technology, the system was installed at the intersection of West Tischer Road and Eagle Lake Road in Duluth, Minnesota. Video data was collected through an on-site video monitoring system consisting of a Digital Video Recorder (DVR) and two video cameras. The first camera records video of vehicles traveling towards the intersection through the vertical curve. The second camera records vehicles traveling through the intersection. In addition to video data collection, mail-in and on-site surveys were conducted.

Overall, the ALWS was effective at reducing vehicle speeds on the main approach, and increasing the wait time and altogether stopping roll-throughs for vehicles on the minor approaches when a conflict exists at the intersection. However, an increase in roll-throughs when no conflict exists at the intersection was observed, which must be addressed in the future design of the ALWS. According to the mail-in and on-site survey results, 80 percent of respondents expressed that the warning system is effective. If the increase in roll-throughs under no conflict conditions can be addressed, the researchers conclude that the ALWS is an effective system for reducing crashes in rural stop/through intersections.

Using ITS to Improve Safety on Rural Highways

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State and local road authorities have been working together developing new ITS (Intelligent Transportation System) technologies to address highway safety problems at intersections and curves. This presentation will detail the traffic safety problems, introduce various technologies being used to address the problems, offer a county highway authority's perspective, and identify the efforts needed to maintain these types of systems.

E-Workplace: Telecommuting Reduces Congestion in the Twin Cities Metropolitan Area

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Objectives of Study

As part of the Urban Partnership Agreement, \$3.5 million were appropriated to promote telework in an effort to reduce commute trips during peak travel periods and help businesses understand the value of telework to their employees and the bottom line. As a result, the eWorkPlace program was initiated. Representatives from Mn/DOT, the University of Minnesota's Humphrey School, Metro Transit, the region's five transportation management organizations (TMOs), and SRF Consulting Group, Inc. collaborated as a team to launch eWorkPlace, providing innovative public outreach, marketing, telework, and evaluation services to Twin Cities Metropolitan Area employers. Subsequently another project was started which focuses on the employer benefits of a flexible work arrangement (e.g. increased worker productivity, facility cost savings and savings related to worker recruitment and retention),

Methodology

The eWorkPlace program is a true public-private partnership, where the public sector provides incentives and support to employers who, in turn, committed to reducing vehicle miles traveled (VMT) and emissions. In order to achieve success, the eWorkPlace Team engaged a complex group of stakeholders; resolved numerous technical, organizational, and management challenges; and clearly demonstrated the positive impacts of telework.

Results

As of September, 15 2010, more than 2,500 workers from 36 employers were participating in the program. The average eWorkPlace participant telecommutes 2.4 times per week, saving about one hour per week sitting in traffic and \$945 per year in vehicle maintenance and operational costs. Collectively, vehicle miles traveled (VMT) by participants are reduced by 90,000 miles every week, which results in an annual savings of 1,746,000 pounds of CO_2 emissions.

Policy Implications

The eWorkPlace project demonstrates that telework is a win-win concept that helps to reduce congestion during peak periods; increases employee productivity and voluntary retention; reduces real estate costs for employers; saves employee time and money while boosting quality of life; and reduces greenhouse gas emissions and the need for costly infrastructure investments for our community. By partnering with a diverse group of employers, eWorkPlace shows that a small percentage change in peak hour travelers can significantly change the operation of the transportation system in the Twin Cities region.

Session Overview

The goal of this session is to provide an overview of the eWorkPlace project, including program results, lessons learned, and participant testimonials. We will also present the detail of the research project which is measuring the bottom line benefit of telecommuting from employer's prospective. The proposed format for this presentation is a panel session with three presenters, and time for questions and answers. The first presentation will provide an overview of the program, including background, methodology, organization, etc.; the second presentation will highlight the program results and lessons learned; and the third will provide an employer's perspective on the value and challenges associated with the eWorkPlace program and teleworking in general.

The Benefits of the Collaborative Process of Compromise: A Case Study from Alexandria, Minnesota

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The City of Alexandria is a beautiful city of approximately 13,000 in west-central Minnesota. Alexandria offers its residents and visitors numerous lakes, parks and trails for recreation, a strong economy and a vibrant downtown filled with numerous commercial establishments. Immediately north of downtown is the Central Lakes State Trail, which is a 55 mile asphalt trail linking three counties and numerous communities. It is used by cyclists and pedestrian for both recreational and utilitarian purposes by local residents, as well as being a significant tourism amenity drawing users from across the State of Minnesota. Separating the trail from the downtown area is 3rd Avenue (TH 27/29), which a 5-lane state highway approximately 60 feet wide and averaging nearly 17,000 vehicles per day. While Minnesota law requires all vehicles on a roadway to yield the right-of-way to pedestrians at unsignalized intersections, drivers often fail to properly yield. Recognizing that this situation could be improved, Douglas County along with the City of Alexandria through a partnership between Douglas County Safe Communities and Active Living Douglas County applied for and received a grant supported by Blue Cross and Blue Shield of Minnesota to conduct a study to identify potential infrastructure improvements. This study evaluated a seven block east-west segment of 3rd Avenue with signalized intersections on either end. While these signalized intersections were equipped with pedestrian actuated walk signals, these intersections (Broadway and Nokomis, respectively) are also complicated by the presence of high traffic volumes – particularly by the number of turning vehicles.

Working with a Steering Committee consisting of representatives from area agencies and businesses, the first step was to identify a "catalogue" of potential pedestrian and bicycle infrastructure enhancements that may have application throughout the area. Also, a more focused analysis was conducted to identify a preferred strategy to improve the crossing of 3rd Avenue by pedestrian and bicyclists, particularly at a location between the signalized intersections of 3rd Avenue at Broadway and Nokomis Street. The intersection of Jefferson Street with 3rd Avenue was identified as a key location where additional pedestrian enhancements would be particularly helpful. The intersection is located roughly halfway between Broadway and Nokomis Street, and Jefferson Street has been identified by the City of Alexandria as a bicycle route through the City connecting the high school, Alexandria Technical College, and major employers.

Three alternatives were developed to present a range of options surrounding a central theme, which generally consisted of a median or pedestrian island, an enhanced crosswalk, and one of the two types of pedestrian actuated signals described earlier. It was determined that the most significant barrier facing pedestrians and cyclists in the area is the overall width of 3rd Avenue and the lack of gaps in the traffic stream appropriate to cross the entire street at once. The Alternative preferred by the City and County included the construction of a pedestrian refuge island on the western approach of the 3rd Avenue and Jefferson Street intersection within the center turn-lane.

The project is an example of how project stakeholders initially approach a problem with differing objectives, but through a process of compromise and collaboration a preferred alternative can be agreed upon. This process of collaboration can build positive working relationships that can influence future projects. The project resulted in collaboration between the City, County, and Mn/DOT to add a pedestrian refuge island to a Trunk Highway. Initially, the County hired WSB to prepare several alternatives that could be used to help pedestrians cross 3rd Avenue. However, since 3rd Avenue is a state highway, the City and County had to work closely with Mn/DOT to gain approval. As discussions began, Mn/DOT expressed some concerns about some of the strategies the City and County wanted to use. In the end, all parties were able to come to an agreement about how to enhance the pedestrian crossing.

The presentation for CTS will present the initial vision for the pedestrian crossing, and how collaboration with Mn/DOT resulted in a different vision for the project. The presentation will discuss how the positive collaboration between all parties on this project has resulted in improved communication on subsequent projects.

Regional Transitway Guidelines

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Objective of Initiative

Establish best practices in the region for key transitway elements. The elements are project development, leadership, and oversight (including travel demand forecasting), identity and branding, vehicles, runningways, service operations, station spacing and siting, stations and public facilities, fare collection systems, and technology. The guidelines are not intended to serve as design standards or specifications. Rather, they will establish consistent, general, technical practices, and a foundation on which project partners can build. The guidelines can be expected to evolve over time as the region's experience with transitways continues to grow.

Approach

An Advisory Committee and nine technical committees developed the Regional Transitway Guidelines. Members of the committees were drawn from the following organizations:

- Transportation Advisory Board (TAB)
- Minnesota Department of Transportation (Mn/DOT)
- University of Minnesota
- Counties Transit Improvement Board (CTIB)
- Suburban Transit Association (STA) (serving areas with transitways identified for investment in the TPP, including MVTA, SouthWest and Maple Grove)
- Cities served by transitways identified for investment in the TPP (Blaine, Bloomington, Brooklyn Park, Columbus, Lakeville, Minneapolis, St. Louis Park, St. Paul and Woodbury)
- Metropolitan Council
- Metro Transit

The technical committees drafted the guidelines. The Advisory Committee reviewed and commented on draft guidelines and approved their presentation to local partners and the Metropolitan Council. The Metropolitan Council will adopt the guidelines by amending them as an appendix to the region's long-range transportation plan, the 2030 Transportation Policy Plan.

Findings or Results

The development effort has drafted technical guidelines for the development of transitways based in best practices observed within and outside the region. Transitways addressed in the guidelines include light rail transit (LRT), commuter rail, Highway Bus Rapid Transit (BRT), and Arterial BRT. The guidelines also provide a more detailed vision for bus rapid transit – Highway and Arterial -- in the region.

Potential Applications

The guidelines inform the development of transitways in the region and beyond.

Policy Implications

The guidelines will support project teams and policy makers in more easily identifying transitway development policy issues including identifying local betterments or other decisions with significant financial or policy implications.

Applied GIS Analysis and Visualization of Mode-Based Commodity Flows Using the FHWA Freight Analysis Framework

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Topic Category Addressed

<u>*Transportation and the Economy*</u> (logistics and freight movement, economic development, the regional and global economies and their impacts, community linkages, and inter-regional corridors).

Objective of Research or Study

Utilize FAF³ to identify and develop GIS applied analyses methods to profile, quantify, and visualize freight movements to, from, within, and across study areas. This work has ensued on several important projects including the 'I-70 Corridors of the Future-Dedicated Truck Lanes Project (Missouri to Ohio)', among others.

Methodology or Approach

Utilize varying FAF³ zone contexts (aggregated and disaggregated) to perform frequencies and summaries to report and visualize improved levels of discretization between freight movement type, mode, and commodity by value and tonnage.

Findings or Results

The improved ease of FAF³ for the discretization and classification of movement types affords a more detailed and informed comparison of modal share. The GIS mapping of proportional flows is effective for improved visualization and understanding of commodity movements. Improved methods concerning the disaggregation of large extent FAF³ 'outstate' zones are being explored to refine rural flows and identify their related network impacts.

Potential Applications

Proportional mapping of flows by mode specific movement types can offer unique perspectives on the diversity, capacity, and utilization of a study area's transportation networks.

Policy Implications

Given the context of differing FAF zone aggregations/disaggregations, better identification of targeted transportation improvements and their implications are possible.

Minnesota Highway Cost Allocation Study

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Highway Cost Allocation (HCA) studies are conducted to calculate the cost and revenue attributions for each vehicle configuration in order to evaluate the equity and efficiency of road-use related taxes. In Minnesota, the last HCA study was completed in 1990. As the transportation and economic environments change, there is a need to re-evaluate HCA results for Minnesota as well as to develop a closer linkage between permit fees and costs imposed within a larger context of costs and benefits.

This presentation will include the results of a HCA study using FY 2004 - 2007 data and based on both a standard Federal Highway Administration (FHWA) tool as well as a customized tool developed for Minnesota. The FHWA tool was designed as a general-purpose tool that could be used by all states. Consequently, there are differences between the required inputs for the tool and the available data in Minnesota, which may lead to errors in cost and revenue attributions. To address these issues, researchers created a customized HCA spreadsheet based on available Minnesota data and results using this customized tool will be included in the talk as well. In addition, a stylized mathematical model will be presented to highlight the extent to which different types of tax adjustments – for example, fuel taxes and mileage-based fees – may achieve tax equity.

Can the Trucking Industry Benefit From Distance-Based Fees?

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The viability and sustainability of the fuel tax as the primary source for funding surface transportation infrastructure continues to be questioned by many policymakers and transportation experts. For several years, the Federal Highway Trust Fund has required substantial infusions from the General Fund to keep it solvent. This is likely to continue, unless a more reliable and sustainable source of funding is found. In this context, the use of a distance-based pricing approach has been identified as the most promising alternative to fuel taxes.

If distance-based charges, also referred to as vehicle-miles of travel (VMT) charges, are to partially or totally replace fuel taxes, political, public and industry support, especially the freight industry, must be secured. The first step to obtaining this support is to demonstrate the benefits and positive trade-offs of VMT charges. This paper will examine the benefits of distance-based charges to freight shippers, carriers and receivers. Among the potential benefits to be investigated are improved truck travel time and travel time reliability; improved infrastructure condition and the positive effect on maintenance costs and preservation of cargo condition; predictability of VMT fees and ability to pass on charges; and other features that make VMT advantageous with respect to fuel taxes. We will also examine potential impediments such as predictability issue under congestion pricing conditions; effect of rate structure complexity on acceptability; and ability to overcome privacy concerns.

2030 Regional Transportation Policy Plan

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Objective

Produce a plan that establishes a new vision for highway investments given the financial realities of State and Federal funding

Approach

Research various topics related to the safety and mobility needs for the region over the next 20 to 50 years

- Principal Arterial Study
- Congestion Management Safety Program
- Metropolitan Highway System Investment Study
- Transportation Demand Management
- MnPASS Part 2

Findings

The plan recommends emphasizing a system-wide management approach with the following strategies:

- Implement an Active Traffic Management (ATM) program on a system-wide basis
- Construct lower-cost/high-benefit highway improvements on a system-wide basis to improve traffic flow by removing bottlenecks, improving geometric design and minimizing safety hazards on the Regional Highway System.
- Develop a system of managed lanes to move more people, more reliably and provide more capacity within existing right-of-way, while providing greater speed and reliability for transit which also benefits freight and people movement in the adjacent general purpose lanes.
- Implement limited strategic capacity expansion in the form of general purpose lanes.
- Implement non-freeway trunk highway improvements consistent with the investments above.
- Support other strategies including Travel Demand Management (TDM), transit investments and land use changes, to reduce future demand on the Metropolitan Highway system.

Policy Implication

Lower-cost/high-benefit investments supplant large expansion investments in general purpose lane capacity.

Assessing Neighborhood and Social Influences of Transit Corridors

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Major transit investments such as new light rail transit lines or new bus rapid transit services often bring significant accessibility benefits to surrounding neighborhoods and lead to the physical upgrading of those neighborhoods. Much research has been conducted examining the physical land use changes associated with transit improvements. It is not until recently that researchers have begun to look into the social changes and community upheaval that take place with the physical upgrading of neighborhoods.

This research adds to the limited literature on transit and neighborhood change by investigating neighborhood and social influences associated with major transit improvements in the Twin Cities metropolitan area. To delineate a comprehensive picture, this research focuses on four transit corridors—Hiawatha LRT, NorthStar Commuter Rail, Cedar Avenue BRT, and Central Corridor LRT, each of which is at a different stage of planning, construction, or operation. For each corridor, the project undertakes four research components, including a multi-dimensional quantification of neighborhood social change in areas near major transit stations, exploration of underlying mechanisms that drive social change, investigation of inter-neighborhood variations in social change, and examination of residents' and business owners' opinions towards social change. A mixed-method approach incorporating both quantitative and qualitative analyses is used to accomplish the four research components. By covering a variety of transit technologies including LRT, BRT and Commuter Rail, results from this research will help policy makers to make more informed decisions about how to prevent and mitigate socially harmful neighborhood changes associated with various types of transitways. By examining a wide range of system development stages including planning, construction, and operation, research findings will help policy makers to determine at what point in the timelines of major transit capital projects policy responses are needed and likely to be most effective.

Region: Planning the Future of the Twin Cities

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This presentation will summarize recent work by Myron Orfield, Thomas Luce and several colleagues which highlights the planning, growth and environmental trade-offs facing the Twin Cities metropolitan area. This work, included in the recent book *Region: Planning the Future of the Twin Cities*, highlights how the region is consuming previously undeveloped land more quickly than population is growing; how population and jobs are growing more rapidly in outer areas; how jobs are now less clustered in high-density centers supportive of transit than in the past; how these patterns threaten the region's remaining environmental assets; and proposes reforms for the metropolitan area's local and regional planning institutions to deal with these issues. The work includes extensive comparisons with other large American metropolitan areas and highlights the implications of the Twin Cities' unique combination of local governance institutions—one of the nation's most fragmented systems of local governments combined with one of the strongest regional governments in the country.

Public Private Partnership (P3) Exploration

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The Minnesota Department of Transportation has been exploring and testing several new funding, financing and partnering strategies under its Innovative Finance Program. One of these strategies is Public Private Partnerships (P3s). Mn/DOT's primary P3 focus has been on new procurement strategies involving private financing such as Design-Build-Finance-Operate-Maintain approaches. Examples of this type of P3 include Virginia's I-495 Capital Beltway project, Florida's I-595 reconstruction project, Texas' LBJ Expressway project, and California's Presido Parkway project.

As part of this P3 exploration, Mn/DOT has completed a P3 Project Screening study to identify P3 project candidates within Minnesota, as well as a St. Croix River Crossing feasibility study that looked at tolling, P3 and value capture strategies to help finance and deliver the project. Mn/DOT is also working with the Humphrey School on a P3 Task Force to help build stakeholder understanding and support for P3 approaches. This presentation will review and summarize these activities.

Alternative Models for Transportation Construction Procurement Auctions

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State Transportation Agencies (STAs) at local, state and federal levels put construction projects out for bid in an attempt to minimize costs and completion times, and maximize quality. Because these bids are scored according to a set of pre-announced weights and low score wins, developing a Request-For-Bids (RFB) that achieves STAs' goals is often difficult. In recent decades, STAs have begun using alternative auction mechanism designs that prescribe weights for quality and completion time. Examples include performance based specifications and early completion incentives. The guidelines for deciding which type of auction to use and how to choose weights for different attributes of contractors' bids are motivated by the intuition and experience of STA engineers, and consider not just cost and time goals, but also flexibility, ease of administration, and contractor relationships.

This presentation will provide a systematic review of the decision process that goes into determining what form an RFB should take. Beginning with reviews of STA reports providing empirical data, we examine the current state of auction design decisions from the perspectives of STA engineers and contractors. We then present a mathematical decision model that is both consistent with practitioner experience and yet flexible enough to examine new possibilities in auction design. We present several examples of specific alternate designs and derive equilibrium contractor bidding responses as well as expected owner cost estimates. We believe that this general-purpose model provides a formal structure for setting RFB parameters and realizing STAs' goals.

Advancing Public Interest in the Launch of PPPs

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Public-private partnerships (PPPs) are not new to the United States. This presentation places PPPs within an historical, global, legal, and political context. In particular, the presentation addresses the question of why the U.S. has lagged behind in the developments of PPPs; examines the legal factors affecting PPPs and the important role that legislation and policies can play in the successful development of PPP projects. The presentation will also explore the political ramifications of PPPs by examining various public concerns over PPPs.

Fargo-Moorhead Interstate Operations Study

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The Fargo-Moorhead metropolitan area has grown significantly in recent years. This growth has led to traffic demand on the interstate system resulting in peak period congestion. Significant investments have recently been made in the interstate system, and more have been identified as future projects. The Fargo-Moorhead Council of Governments sought to analyze future interstate operations and evaluate whether travel was balanced on the local system and peak traffic demand could be rationalized.

The Interstate Operations Study Phase II considered a broad spectrum of potential approaches to improve future interstate system operations. This process began with a series of Themed Alternatives ranging from operational and service-oriented solutions such as ramp metering and transit to infrastructure-intensive solutions including river crossings and capacity expansion. The effects of these approaches were evaluated using a VISSIM model covering the entire interstate system.

Themed Alternatives exhibiting meaningful benefits to the interstate system were grouped into strategic combinations of approaches called Hybrid Alternatives. The Hybrid Alternatives demonstrated amplified improvements on the interstate system due to synergies between the approaches in the simulation models. Cost estimates were prepared for each to identify the combination of improvements expected to provide acceptable operations most cost effectively.

The recommendation of the study included pursuit of travel demand management techniques to reduce peak traffic volumes through improved transit service, land-use planning, and employer-supported programs. Ramp metering will be investigated further to help maintain the operational integrity of the interstate. Finally, a moderate number of improvements to the interstate were recommended in locations not fully addressed through ramp metering or demand reduction.

The success of the Interstate Operations Study was achieved through cooperation between Council of Governments, SRF Consulting Group, Advanced Traffic Analysis Center, and city, county, state, and federal government officials. Decision-making and study guidance was provided by committee members. The ultimate success will be measured by the commitment of stakeholders in the region to carry out the recommendations in the final report.

Twin Cities Congestion Management Safety Plan, Phase III

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Study Objective

Highway congestion in the Twin Cities Metropolitan Area (TCMA) has been growing over past decades and is expected to continue grow as the regions' population increases over time. While congestion is a natural outcome of continued economic growth, it can result in negative safety, economic, and quality of life impacts to all travelers. It affects multiple travel modes including automobiles, trucks, and transit, and it affects multiple jurisdictions as users find alternate routes to avoid major delays (i.e., use of local routes which impacts pedestrians and bicyclists).

The Twin Cities Congestion Management Safety Plan (CMSP) focuses on identifying traffic problem areas along the Twin Cities Highway System, developing lower cost/high benefit solutions to those problem areas and then prioritizing those solutions for potential funding and implementation. The goal is to put the focus on problem locations where for a smaller investment can result in reduced traffic congestion and safety issues for not only vehicular traffic, but other modes as well including transit, pedestrians and bicyclist.

Methodology or Approach

This study builds on previous work completed under CMSP Phase I and II. Under the CMSP Phase I, an initial list of projects was developed to address congestion related issues in the TCMA. Several of these projects were fully implemented. CMSP Phase II really considered the process on how to evaluate the system, develop solutions and how to evaluate those solutions. In addition it investigated nontraditional solution sets that included management strategies such as dynamic shoulders and variable speed limits, as well flexible design elements such as reduced shoulder widths at critical locations. CMSP Phase III takes the initial list under CMSP Phase I and the process developed under CMSP Phase II to develop a new list of projects for implementation. The study was led by Mn/DOT and included partners from the Metropolitan Council, and FHWA.

The study also considered a project framework that defined how the CMSP process can be institutionalized and be developed into a program on a cyclical basis. This process includes reevaluation of the problem areas and solutions, defining the decision making process on projects and considering post project evaluations for effectiveness.

A Study of the Operational Flexibility of DDIs: Real Minnesota Examples

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Study Objective

Across the county public agencies are looking for innovative ways to increase the capacity of existing interchanges while minimizing the need for new infrastructure. The Diverging Diamond Interchange (DDI) is latest interchange design configuration that can assist in achieving this goal. This presentation looks at three real examples in Minnesota of potential applications of this interchange configuration to address significant traffic challenges with relative low capital costs.

Methodology or Approach

Research to date details the analysis of how existing diamond interchanges can be easily modified to DDIs while maximizing the use of existing infrastructure. The studies have documented the increased capacity and improved operation benefits of a DDI compared to a standard diamond, particularly at locations where the through movements on the minor road are light and the turns to and from the mainline are heavy. This presentation will walk through three Minnesota examples from Rochester (TH 52/55th Street), to Bloomington (I494/34th Avenue) and Chaska (TH 212/CR 140), where these design configurations were evaluated for their ability to address traffic challenges while minimizing capital costs and impacts.

Traffic flow patterns vary by location and time of day and in some cases when nearing the capacity of a DDI, flexibility in the operations can extend the life of the design. This study considers unique lane and intersection configurations to limit costly bridge expansion/modifications. Information will be presented showing differences between alternatives and why diverging diamonds have advantages under certain conditions.

Findings or Results

That based on analysis that these types of designs can show real operational advantages with minimal costs as compared to more traditional design approaches.

Potential Applications

These designs show real potential for addressing interchange issues in a number of locations; the intent of this presentation is to expand awareness of these types of interchanges so that they can be considered as one of the potential options for extending life of an interchange with minimal cost.

Young Forever

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Young Forever is a realistic educational program directed toward young drivers by the Minnesota State Patrol. The program consists of a 15 minute video and 45 minute follow-up discussion presented by a Minnesota State Trooper which focuses on decisions young people are confronted with as they begin their driving careers. The goal of this impactful, emotional presentation is to help young people learn from the experiences of their peers and develop skills to assist them in making smart, safe decisions every time they get behind the wheel or ride in a car.

Driver Distraction: Instructional Video Game for the New Driver

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The Intelligent Transportation Systems Institute at the University of Minnesota is developing an instructional video game designed to increase awareness of the hazards of distracted driving among teens. We are developing the game as a highly interactive "casual game" style challenge that will develop an awareness and appreciation in the end-user of factors that can negatively impact driving and their relative magnitude, and the value of ITS research and methodology in the area.

The game's objectives are threefold:

- To Help Teens and Young Adults Understand the Importance of Concentrating on Driving and Refraining from Engaging in Extraneous Activities
- To Use the Human Factors of Driving to Increase Interest in Cognitive Psychology as an Area of Interest through Non-Intuitive, Open-Ended, Thought-Provoking Questions
- To Gain National Attention of ITS by Providing a Unique and Valuable Tool for Teen and Young Adult Drivers and Those Who Educate Them

The game will guide students to an understanding of the importance of concentrating on driving by allowing the student to experiment with their behavior. They will recognize and experience emotionally the immediate and often positive consequences of engaging with common distracters, but they will also experience the long-term, possibly devastating, consequences.

The program will do all of this while presenting a fun, addictive, engaging experience. Teens will enjoy the role of a "rogue" entrepreneur pizza delivery person using various social media and other technology to build a business and defeat competition. Mix in roadside pizza delivery and the attack of the giant flies, and the game becomes a fun and engaging education tool that delivers a serious message, all in a "safe" virtual environment.

The key features of the game are distracters and markers. Distracters include radio, voicemail, GPS, smartphones, food & drink, and the giant flies. The relative impact of each distracter is tied directly to existing research. Markers are items to which the user must respond. These include stop signs, construction cones, rough roads and pizza customers. Following each level or attempt, users will receive custom feedback on their attentiveness as measured by their use of the distracters and their success in navigating the markers.

The ITS Institute will also be developing a curriculum for high school students that uses the game as a launching point to discuss the principles of cognitive psychology that are at work while driving. Both the game and the curriculum are expected to be completed by Fall 2011.

Southeastern Minnesota Teen Tool Kit

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A traffic safety educational toolkit was developed in southeastern Minnesota for distribution to area high schools. Crash data showed that December, May and June respectively showed a significant increase in teen traffic-related severe injuries and fatalities. In addition, there was an over-representation of teens attributed to lack of seat belt use, drinking, speeding and inattentive driving.

The first goal was to educate teens during high fatality months during enforcement waves to help them realize what a large responsibility it is when a person gets behind the wheel of a motor vehicle. The 3-week toolkit included public safety announcements on a DVD for visual use, as CD for audio use and a CD for print materials; banners, posters, handouts and a map of traffic fatality and severe injury crashes. The kits were distributed to more than two dozen high schools for implementation. A survey was included in the kits for feedback on how the program was used and any suggestions for changes. In addition, one high school that wasn't included asked to be sent a kit for their school.

Minnesota's Transportation Economic Development (TED) Pilot Program

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A competitive grant program called the Transportation Economic Development (TED) Pilot Program was established using bond funding provided by the 2010 Minnesota State Legislature. The program is jointly administered by the Public Finance Authority (PFA), the Minnesota Department of Transportation (Mn/DOT), and the Minnesota Department of Employment and Economic Development (DEED) and is designed to address both the state's transportation system needs and economic development objectives; to create and preserve well-paying jobs across the state; and to leverage private and local investment in transportation infrastructure improvements. This \$39 million program is funded with \$30 million in trunk highway bonds legislatively designated for the construction of interchanges; \$5 million in uncommitted state road construction trunk highway bonds; and \$4 million in general obligation bonds designated for business development public infrastructure.

A solicitation for TED project proposals was released in October 2010. Projects are scheduled to be selected in late December 2010. This proposed research report will outline the process used to develop this unique, multi-agency grant program and provide as yet unavailable details on the outcome of the grant program in terms of the blend of projects funded through the program and the economic impacts anticipated as a result of the transportation investments.

Corridor Preservation Planning for Freeway Conversion and Airport Expansion in Rochester, Minnesota

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Objectives of Study

Olmsted County, the Rochester-Olmsted Council of Governments, and the Minnesota Department of Transportation are collaborating on a long-term multimodal improvement plan for Trunk Highway (TH) 63 and the Rochester International Airport, a growing intermodal hub in the region. The plan focuses on evaluating improvement alternatives to address long-term safety and traffic needs along six miles of the TH 63 corridor, access needs for the airport to meet future airport development, and improvement needs for other roads in the area to accommodate future growth. The plan will serve as a guide for the city, airport, county, and state as they implement needed improvements incrementally over time.

Methodology

Through robust public involvement efforts, stakeholders have addressed numerous issues including the realignment of roadways, freeway conversion, protection of environmental resources, airport-related land use restrictions, and potential trail, light rail, high speed rail, and freight rail alignments. The study will include an adequate level of design and environmental analysis to support the adoption of Official Right of Way Map(s).

Findings

Through a detailed evaluation process, the Project Steering Committee recommended a set of roadway alternatives that meet the project's goals and objectives, and are consistent with a NEPA-level Purpose and Need Statement. Specific findings include modifications to a system interchange, a new interchange with roundabouts to provide improved access to airport facilities, and a long-term, phased approach to remove direct at-grade access to TH 63 as it transitions to a freeway facility over time. Additionally, study findings addressed agricultural and other freight shipping needs, regional trail development, and issues associated with connecting potential freight and passenger rail corridors to the airport.

Potential Applications and Policy Implications

The proposed session will highlight the myriad of issues associated with this project and the methods used to evaluate and analyze multiple, overlapping improvement strategies. Furthermore, the session will address the importance of cooperation among government agencies and how public participation can influence and shape the study. Many of the issues addressed in this project are important transportation topics that will confront transportation professionals in the coming years. Attendees will be able to leave the session with a better understanding of strategies that can be applied to their specific geographic area or sector of transportation.

The Interchange: Stage I Environmental Assessment

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On November 16, 2009, Northstar Corridor Commuter Rail began service from Downtown Minneapolis to Big Lake. Northstar ends in Downtown Minneapolis by the Target Field Station, a functioning multimodal station that connects with Hiawatha Light Rail Transit (LRT) at the intersection of 5th Street and the BNSF Railway, and Metro Transit bus service at the 5th Street Garage. In the future, the likely convergence of additional commuter rail, LRT, the Cedar Lake bicycle trail, intercity rail, and high speed rail lines will require additional facility space, infrastructure improvements and public space to handle the intersection of all these transportation modes. The individual transportation/transit projects have assessed their needs as an independent line. The Hennepin County Regional Rail Authority (HCRRA) has taken up the challenge of integrating the planning for the spatial and infrastructure needs required to effectively facilitate the movement of people and goods in a complex changing urban context. Based on ridership estimates for the current and future projects, there could be up to 20,000 passengers per day requiring service in Downtown Minneapolis at this connection site. This presentation will highlight the planning and environmental process undertaken for this high profile project, including the infrastructure, transportation, economic, and outreach challenges and opportunities.

Impact of Transit Signal Priority on Bus Service Performance

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Minnesota is one of several communities nationwide to receive funding through the U.S. Department of Transportation's Urban Partnership Agreement (UPA) program. The key objective of Minnesota UPA program is to develop strategies, implement and deploy applications to reduce traffic congestions in the Twin Cities. As part of the Minnesota UPA program, the Transit Signal Priority (TSP) component led by Metropolitan Council and other stake holders is to improve arterial transit service and, as a result, to relief highway congestion.

TSP has been studied and proposed as an efficient way to improve transit travel and operation. Bus signal priority has been implemented in several US cities to improve schedule adherence, reduce transit operation costs, and improve customer ride quality. Signal priority strategies have helped reduce the transit travel time delay, but the transit travel time reduction varies considerably across studies.

Beginning in 2008, Metro Transit has equipped all buses with TSP onboard systems. Mn/DOT and City of Minneapolis and have instrumented 27 intersections (from 2nd Street SE to 53rd Avenue NE) along Central Avenue with TSP capability. At the end of 2009, running time of bus #10 (RTE10) was reduced by about 2 minutes on all trips and service types along the route.

This paper evaluates the preliminary impacts of TSP and semi-actuated signal control on the performance of RTE10. Four separate months (Nov. 08', Apr. 09', Oct. 09' and Oct. 10') of bus AVL/APC data, before and after the TSP implementation, were analyzed to evaluate the improvement on bus travel time and impacts on schedule adherence.

Arterial Transitway Corridors Study

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Arterial bus rapid transit (BRT) is a cost effective means to deliver improved transit service quality in dense urban areas. Metro Transit, the Twin Cities region's largest transit provider, launched a comprehensive study of eleven arterial transitway corridors to evaluate the potential of arterial BRT improvements. The agency will develop and evaluate arterial BRT concepts, leveraging national and local research and past planning efforts.

For relatively low cost capital investments of \$1 million to \$3 million per mile, arterial bus rapid transit has improved bus transit in many communities throughout the country. Other regions have experienced significant ridership growth and improved public perception of bus service on high ridership routes for relatively low capital and operating cost increases.

The eleven corridors to be evaluated in the Arterial Transitway Corridors Study include Snelling Avenue, East 7th Street, West 7th Street, Robert Street, Central Avenue, Nicollet Avenue, Hennepin Avenue, Lake Street, West Broadway, Chicago Avenue, and American Boulevard. The routes serving these corridors carry nearly 40 percent of Metro Transit's daily bus passengers.

The Arterial Transitway Corridors Study began in late 2010 and will conclude in late 2011. At the CTS Research Conference in May 2011, agency staff will share research on the features and performance of arterial BRT across the nation and early progress on local study corridors. The presentation will also offer a preview of facility and service planning to be conducted in the remainder of 2011.
Viability of Modern Personal Rapid Transit Applications

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The past decade has seen significant advances in testing, evaluation, feasibility studies and construction of close to a dozen personal rapid transit (PRT) concepts and systems around the world. This interest has been spurred, on the one hand, by the potential environmental benefits of PRT regarding low greenhouse gas emissions, non-reliance on petroleum-based fuels, relatively low energy use, and low use of land and space. On the other hand, it is now understood that PRT can contribute to increasing ridership on traditional transit by serving as a collection/distribution system at transit stations, especially at the trip beginning and end (i.e., filling the first-mile/last-mile service gap that characterize many transit services). Additionally, PRT can serve many activity centers such as downtowns, airports, shopping centers and campuses that are not well served, if served at all, by traditional transit. Finally, advances in technology have overcome many of the obstacles raised by the public and skeptics in the past. Several PRT systems have achieved the short headways that, until relatively recently, were considered to be theoretical only. Similarly, the ability to stop when operating with short headways and typical PRT operating speeds has been certified as safe. Different vehicle designs have been built and tested under many conditions, including heavy snowfall and cold. However, obstacles remain and they continue to be examined.

PRT's short wait times, high average speeds, frequent station spacing and non-stop, point-to-point service, result in a high level of service that makes PRT competitive with automobiles in many applications.

This paper will examine (1) applications worldwide to understand the rationale behind the selection of PRT over other available modes; (2) potential applications in the U.S., where a number of cities are conducting feasibility studies; and (3) interest and potential applications in Minnesota.

Rough Roads are Expensive for Minnesota Motorists

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Transportation agencies use road roughness as a key performance measure to indicate how customers view the quality of the system, and to provide engineers and planners a guide on the need for future preservation and rehabilitation investments. More recently, the effects of road roughness on user costs has been examined. Rough pavements reduce fuel economy, accelerate vehicle deterioration, increase vehicle maintenance and tire wear, and cost more to maintain and rehabilitate. A recent study estimated rough roads cost Minnesota road users on average of \$347 per year – a total of over \$1.3 billion. These costs are expected to increase as fuel prices continue to rise and the percentage of roadway miles in "poor" condition is projected to increase.

Simple Test to Determine Low Temperature Material Parameters Used in ME Pavement Design Guide

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The presentation details the research performed as part of two NCHRP Idea projects dealing with obtaining asphalt mixture creep compliance and bending strength from tests performed using the current BBR (Bending Beam Rheometer) equipment on small mixture beams.

In the first part a description of the research performed to investigate asphalt mixture creep stiffness is proposed and the comparison with the IDT (indirect Tension Test) results is presented. Next the issue of size effect on asphalt mixture creep stiffness is evaluated on three different beam sizes. Digital image analysis is used to investigate the Representative Volume Element (RVE) for Asphalt Mixtures. Estimation of volume fraction and grain size distribution of aggregate phase is obtained on the three different beam sizes starting from the digitalized binary image.

In the second part of the presentation the investigation of asphalt binder and asphalt mixture strength is addressed. For this study a new BBR device capable of increasing and decreasing load with different rate was used. This new device was developed on the basis of a previous exploratory work performed with a modified BBR machine. Preliminary results showed that IDT and BBR tests provide similar values of strength when geometry and specimen size are taken into account through size effect theory.

In the current phase of the research the statistical distribution of asphalt mixture strength is evaluated on small BBR beam specimens; the results show a Gaussian distribution rather than Weibullian, which is typical of quasibrittle and brittle materials.

As regard to asphalt binder, strength tests were performed both with the new BBR device and DTT and the results compared showing a significant difference in the results with BBR having much closer curves in the stress strain plane.

Non-destructive Evaluation of Pavements Using an Emerging Ultrasonic Tomography Method

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MIRA is an ultrasonic tomography device that can be used to diagnose subsurface concrete condition using an array of dry point contact (DPC) "touch-and-go" transducers (doesn't require surface preparation). Each transducer can both transmit and receive low frequency (55 khz) shear waves. The DPC transducers provide the necessary consistency of impact and wavefront penetration for diagnostics up to 3 ft deep for typical concrete surface textures. MIRA incorporates 10 channels each comprised of 4 transducers in a multi-static array. This linear array allows for 45 transmitting and receiving pair measurements in each approximately 1 second scan that can be applied at a high productivity. The increased redundancy of information in each MIRA scan allows for consistent evaluation of heterogeneous mediums such as Portland cement concrete (PCC). Advancement of the signal interpretation techniques for this ultrasonic tomography device as well as field applications of MIRA are discussed.

Vision-Based Bicyclist and Pedestrian Counting Systems

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Estimating bicyclist and pedestrian traffic is useful for planning transportation facilities. Manual counts are used to reliably determine the pedestrian and bicycle traffic. However performing manual counts over an extended period of time is tedious and requires a great degree of effort. Sometimes the counts are carried out over shorter durations, but this skews the statistical significance of the counts. There have been many technological solutions in the market to help carry out the counting process effectively. Some examples are loop detectors, buried pressure sensors, pneumatic rubber tubes etc. These solutions have their own advantages and disadvantages. We propose a vision-based low cost solution which overcomes many of the shortcomings of existing methods. From a computer vision perspective this is an object classification problem. We investigated two different approaches to solve this object classification problem. In the first approach we extracted interesting regions and points from images of bicyclists and pedestrians, and built discriminative classifiers. We evaluated this approach on about 8 hours of video containing more than 500 bicyclists and the best accuracy obtained was 80%. The problem of modeling a bicyclist visually is tricky because bicyclists are composite objects i.e. they consist of a bicycle as well as a human. Therefore we might not get as many distinct regions or interest points to perform the discrimination. In our second approach we use the concept of dictionary learning to label atomic sections of the images as to where they originate from. Based on two discriminative dictionaries (bicyclists and pedestrians) a voting process is done in patch (small image parts) level and then the votes are combined to make a prediction holistically on the entire image. This method yielded better results and a classification accuracy of 86% for bicycles and 98% for pedestrians was obtained.

Measuring Managed Highways: Emerging Tools for the Emerging Roadway System

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The need to provide technical information to assist in transportation system planning and design has always existed. But most metropolitan transportation system plans continue to evolve from interstate era new freeway construction to multi-modal, managed refinements to existing roadways. Whereas the models of a general ago were needed to determine the best location and required number of lanes needed on a roadway, current planning issues are more focused on consideration of marginal benefits operational changes. Can the tools currently being used provide useful information for the new types of decisions?

This presentation will outline and discuss the capabilities of past, current and emerging roadway modeling techniques to appropriately address the policy and design questions of today and tomorrow. In particular, it will look at new "mesoscopic" modeling techniques of Dynamic Traffic Assignment (DTA) as a way of providing such more refined forecasts of HOT lane use and revenues, low-cost/high benefit improvements and advanced traffic management. Different DTA methods will be previewed, as will factors that may limit their widespread use.

Advances such as tour-based or activity-based models also provide great strides in analysis capabilities, but are beyond the scope of this presentation.

Weekday Peak Hour Mean Flow Estimation Using Two-Day Short-Count Data

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Estimates of traffic volumes for particular periods within a day, such as the peak periods, are essential for capacity and level of service assessment, traffic control device selection and implementation, traffic impact analysis, and more refined exposure measures for traffic safety. In this paper, we propose a method to estimate the weekday peak hour mean flow using two consecutive weekday counts, which is able to characterize the estimation uncertainty and does not require creating and assigning factor groups. The model assumes that there exist similarities between a short-count site and an automatic traffic recorder (ATR) site in terms of temporal variation patterns and day-to-day flow covariance during peak hours. Given an ATR site and a pair of two-day counts of a short-count site, the posterior distribution of the weekday peak hour mean flow for the short-count site are calculated as the data-driven weighted averages of the ones given individual ATRs. The proposed method is evaluated by actual Twin Cities 2005 ATR data using a leave-one-out cross-validation approach, and shows that more than 70% of short-count sites are able to capture the ground truth at a significance level of 0.05. We find that the estimation error is mainly caused by the temporal variation factor difference between a short-count site and the ATR sites providing adjustment factor prior information.

Transportation and Quality of Life: Assessing and Comparing Dimensions

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Quality of life has multiple definitions yet specific indicators for transportation remain absent. This project assessed and evaluated transportation related quality of life indicators qualitatively. First, a literature review assessed the 2010 state of quality of life research within and beyond transportation issues. Then, focus groups identified quality of life indicators and further differentiated how transportation elements contribute to or detract from quality of life.

Twenty five focus groups with representative communities across the state were conducted by trained facilitators. Each focus group had between five and twelve participants and standard focus group procedures were followed for each session (Krueger & Casey, 2008). Focus group locations were selected to represent a variety of geographic locations, represent a variety of community sizes, represent all Minnesota Department of Transportation districts, three life stages (young 20-34, middle 35-59, 60+ years), as well as broadly explored quality of life among racial/ethnicity groups in both metro and non-metro locations. Focus group participants were recruited via phone from a purchased sample of the geographic community of life and the role of transportation and transportation-related services in quality of life assessments. Group discussions were held at locally known meeting places, digitally recorded and staffed by an additional note-taker. Field notes added to data verifiability.

Results indicate a commonly held list of quality of life attributes and that list includes transportation. Some transportation elements that contribute to or detract from quality of life include: convenience and accessibility, multi-modal transportation options, traveler information and communications, traffic and congestion, and public transportation (a theme as both a contributor and a detractor). Differences in these transportation factors emerged both by age and geographic location. Implications for future research and transportation planning are presented.

It's a Two-Way Street: Transportation and Public Health Intersect

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This session will explore the growing intersections between public health and transportation planning and describe how the Statewide Health Improvement Program is supporting improved health through community design. Participants attending this session will understand: (1) what the Minnesota Department of Health's Statewide Health Improvement Program (SHIP) is and how it relates to transportation planning; (2) how improving the built environment and transportation infrastructure is an evidence-based strategy for promoting physical activity, including non-motorized transportation; and (3) how communities around the state are encouraging policy, systems and environmental changes that impact the built environment, transportation system and improve health.

Measuring What Matters: An Online Accessibility Mapping Tool

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People who make transportation and land-use decisions in the Twin Cities region will soon have a new tool: an online "accessibility matrix" that captures variations in accessibility to different types of destinations for travelers who drive, bike, walk, or use transit. For each origin area, a user can create a matrix with columns representing types of destinations and rows representing travel modes. Each cell tells how easy it is to reach the specified destination activity using a chosen mode. For example, a resident of Anoka could learn the accessibility of jobs in Eden Prairie by bus or by car. The matrix has a number of predefined maps and also allows users to create their own maps at the census block level. Users can select up to three filters, including year, mode, purpose, and destination type (such as retail, food, or time of day). This presentation will provide a demonstration of this new online tool, as well as discuss the major themes from the Access to Destinations research study.

Mn/DOT's Framework for Achieving Sustainable Transportation

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Sustainability is shaping Mn/DOT's vision for delivering a safe, reliable and modern transportation system that respects, supports and regenerates the environment, the economy and society both now and for generations to come. This focus is driven by many factors, among them, changing demographics, shifting travel patterns and methods and changes in how we work and live. We are beginning to see a "new normal" and a focus on sustainability can ensure Mn/DOT responds appropriately.

Mn/DOT's Sustainability Initiative:

- Responds to a "new normal" through changes in business practices and in the transportation system itself;
- Prompts innovation and creative thinking;
- Insures quality of life is a factor in determining the best practices to use and the right investments to make; and
- Fosters innovation and closes the gap between policy and technology.

Over the past year Mn/DOT has been exploring what sustainability means for transportation, what is currently being done and what else could be done. Current work focuses on complete streets and modal integration, quality of life, and the transportation-land use linkages by May the initiative will be fully underway, with a range of projects underway that look at sustainability from planning through construction, operations, and maintenance.

Developing a Model Framework for Regional Sustainability Planning and Implementation

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In recent years the concept of sustainability has become an integral part of the planning process. The notion of sustainability inherently transcends the borders that define a plan, dictating the need for planning at a broader geographic scale. As the concepts of sustainability and regional planning simultaneously gain traction, it is necessary to evaluate existing interpretations of their dynamic relationship in order to inform future efforts. This research examines approaches to planning for and implementing sustainability at a regional scale. The research informs a model framework for regional sustainability planning and implementation for use by organizations and stakeholders interested in pursuing sustainability planning in their own regions, as well as in evaluating regional sustainability planning efforts. The *framework* provides a user-friendly and adaptable model for application in a variety of contexts. Informed by detailed case-study analysis, the *framework* addresses: (1) the content of regional sustainability plans, (2) the processes used to develop plans, and (3) approaches applied in implementing and monitoring plans. The *framework* is informed by regional sustainability planning cases selected from a broad range of organizational contexts (e.g. council of government (COG), metropolitan planning organization (MPO), regional rural development organizations, multi-jurisdictional corridor, watershed). Further, cases will be selected to reflect diverse locations, sustainability issues (e.g. environment, equity, economy), and planning issues (e.g. transportation, housing, economic development). The methodology used for case study evaluation draws on existing research on regional sustainability planning approaches and previous evaluations of regional planning and sustainability planning efforts. The *framework* will be applied and tested in the context of the Twin Cities metropolitan area, resulting in a possible model approach to sustainability planning for use in the region and in other locations.

Evaluation of Governance of Transit in the Twin Cities Region

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In March 2010, the Legislative Audit Commission directed the Office of the Legislative Auditor to evaluate the governance of transit in the Twin Cities region. Our evaluation report will be released to the Minnesota Legislature in January 2011. The attached project description provides an overview of the research questions we evaluated and the methodologies we used. Our findings and recommendations are classified as "not public" until the report is released. The final report will include recommendations for change directed at the Legislature, the Metropolitan Council, and regional transit stakeholders.

Overview of Minnesota's Area Transportation Partnerships, Metropolitan Planning Organizations, and Regional Development Commissions

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This presentation highlights key findings from a recently released report - Mn/DOT's Overview of Planning and Programming in Minnesota – which discusses how planning, project selection and programming occurs in Mn/DOT and our partners. This study examines the different structures, practices and roles of Minnesota's eight Area Transportation Partnerships, seven Metropolitan Planning Organizations and nine Regional Development Commissions. Differences in the project selection criteria, organizational structure and use of subtargets are discussed. Key themes include the role of geographic equity in transportation project selection and the relationship between MPO organizational structure and planning roles.

Pavement Management Tools For Minnesota

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Recently the Local Road Research Board has funded the development of multiple tools focused on Pavement Management:

- **DVD:** "Do the Right Thing at the Right Time" (2010, 7 minutes) This DVD was developed to help local agencies understand the benefits of pavement management through others experience.
- **Pavement Management Workshop (2009)** Provides an overview of the benefits of pavement management along with a detailed review of various pavement management software programs that are used in Minnesota. Workshop participants will leave with the knowledge to evaluate and implement a pavement management system.
- **"Implementation of Pavement Management in Minnesota" Report (2009)**: A resource guide was developed that describes, in detail, the various pavement management system software programs available and innovative and high-impact examples of the use of pavement management systems in Minnesota. This guide was developed to help agencies evaluate and implement a pavement management system.
- Pavement Management System Software Program Comparison Matrix (2009): A matrix was developed to provide an objective review of the pavement management system software programs currently used by agencies in Minnesota. This matrix does not favor or recommend one pavement management system product over another, but rather serves as a neutral source of information and comparison of software programs.
- **Pavement Management Systems Brochure (2009)**: This brochure is intended to educate local agencies on what a Pavement Management System is, why it's important and provide information on the resources that are available.

During this session, the presenters will show the recently completed DVD and educate the audience about the importance of pavement management and highlight the various tools that are available.

Highway Systems Operation Plan Update

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Study Objective

The Minnesota Department of Transportation (Mn/DOT) is currently working on an update to the Minnesota Statewide *Highway Systems Operation Plan* (HSOP). The main objective of the Plan is to support Mn/DOT's Strategic Directions and Transportation Policies and to provide a framework for managing key maintenance activities throughout Minnesota. This operations plan is a significant step to assessing the challenges of preserving and maintaining the State's transportation infrastructure at a time when resources are dwindling and pressure is increasing to deliver more and better services. This planning effort builds upon Mn/DOT's Statewide Transportation Plan from a maintenance operations perspective.

Methodology or Approach

Major trends and key factors that directly affect and/or influence maintenance operations work activities are being documented as part of this process. The uniqueness of this Plan Update is that it identifies the linkages between maintenance operations activities and Minnesota's other Family of Plans including the Statewide Plan, District Plans, Multi-modal Plans, and Highway Capital Investment Plan. Performance measures in the operations and maintenance area were developed by setting targets for each of the measures. Based on user expectations and policy direction, five performance categories have been identified for the HSOP Update. These performance measure categories are:

- I. Safety
- II. Good Stewarts of the Environment
- III. Seek Innovation
- IV. Infrastructure Asset Management Maintain and operate the system to preserve and extend the life of system elements
- V. Understanding System and Cost Trends Legislative mandates and Federal regulations

Based on identified trends and present performance levels, funding gaps and/or changes in maintenance operations activities to meet performance measures are identified.

In addition to updating the previous maintenance activities included in the original HSOP, the Plan Update also includes new focus areas for measuring and tracking performance. A complete listing of the maintenance categories being evaluated is included below:

- Smooth Roads
- Structures
- Clear Roads
- Safety and Guidance Systems (new)

- Arterial and Freeway Operations (new)
- Fleet and Facility Management
- Roadsides (new)
- Administration (new)

Findings or Results

While this study is currently being completed, the research and findings will be ready in early 2011. The supporting data in the maintenance area will be analyzed to track Mn/DOT's progress in achieving the performance measures for the different maintenance categories. Level of service changes and/or priorities for various maintenance operations work activities based on different levels of investment will be identified.

Potential Applications

The methodology and analysis methods used in this study will likely be of interest to other local government agencies that deal with similar maintenance activities and performance issues. Particular areas of interest include how Mn/DOT is measuring performance and customer expectations and relating this to cost of service.

Policy Implications

Mn/DOT continues to be a national leader in the use of performance measures and the HSOP Update is one of the only statewide maintenance operations plans in the country. Limited information has been developed nationally to assess performance in the maintenance and operations area. This Plan has proven to be an effective tool for communicating ongoing needs and the effectiveness of maintenance activities.

Waste Shingles Help Address Low Volume Road Needs

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Many local Governments have networks with significant miles of low volume roads. Maintenance costs for these roads continue to increase because gravel is lost to grading and traffic; dust control is a problem and smoothness is difficult to maintain. Gravel road stabilization can address these problems by locking up the gravel and providing a smooth surface while maintaining a rural road aesthetic. Stabilization becomes less attractive for low volume roads when additives are required at application rates that become cost prohibitive. Waste shingles offer a viable means to offset additives required in the stabilization process since significant asphalt is present in the shingles. Preliminary design analysis has shown that emulsion content can be reduced by up to 5% saving significant costs from the stabilization process. Blue Earth County conducted a demonstration project using waste shingles to address a low volume road need. This presentation covers this green process as it puts a waste product into a valuable road rehabilitation application. Should this rehab alternative become a viable low volume road solution it will address a significant need among local Governments.

Update on Mn/DOT's County Roadway Safety Plans

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Mn/DOT has undertaken a project that is unique in both objective and scope – developing a safety plan for every county in Minnesota that identifies safety emphasis areas, high priority safety strategies and location specific safety projects – the application of the high priority safety strategies at the most at-risk locations. Phase I of the project was recently completed – the Safety Plans for the twenty counties in Mn/DOT Districts 3 and 6 have been delivered to each county engineer. These Plans identified over \$70 million of safety projects, including; 2,800 miles of rural road edge treatments ((\$26M), improved delineation at 4,500 horizontal curves (\$35M) and 1,250 intersection improvements (\$11M).

Phase II of the project is on schedule to have identified the safety projects for the 24 counties in Mn/DOT Districts 4 and 8 by the time of the 2011 CTS Research Conference. The update will document the results of the analytical processes that will be applied to something on the order of 10,000 miles of rural highway, 6,000 horizontal curves and 3,000 intersections and then the suggested projects that are developed through the data driven process.

Using High-Resolution Detector and Signal Data to Support Crash Identification and Reconstruction

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Traffic crashes may not always result in severe or fatal injuries, but can still have nontrivial impact on system performance, particularly during heavy traffic conditions. One way to reduce the frequency of such incidents is to identify the necessary circumstances that resulted in the collision. However, road accidents, particularly intersection related crashes, are complex phenomenon and may result from different combination of causal factors such as excessive speed, successive braking of vehicles, signal violation, inadequate gap acceptance during merging, lane changing or taking a right turn on red. Recent traffic studies have witnessed increased use of high-resolution arterial traffic data to evaluate various traffic performance measures. It is also important for traffic safety engineers to explore such high-resolution data to analyze crashes, and identify the necessary causes of the crashes. In this study we illustrate, for one particular intersection crash resulting from signal violation, how high-resolution event-based data obtained from loop detectors can be used to identify the incident and the vehicles involved in the crash. We also illustrate how high-resolution data could support a traditional reconstruction of this crash. A Monte Carlo simulation technique was used to estimate the most probable combination of the driver behaviors that resulted in the collision. It was found that the excessive speed of the vehicle violating the red light was the most critical factor contributing to the crash.

The Predictive Power of Differences in Exposure and Individual Driver Characteristics for Accidents Among Tractor-Trailer Drivers

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From 1,065 trainee truckers we collected measures of cognitive skill, measures of economic preferences, a personality profile (the Multidimensional Personality Questionnaire), and a demographic profile. We then followed the 950 drivers (765 of whom have full data) who completed training and began work, collecting the number of miles and trip segments driven each week, the type of work (e.g. dedicated to a single customer, or running the system), and accidents. Accidents in heavy vehicles are normally of very low incidence, and therefore hard to analyze statistically. However, we are examining new-to-the-industry drivers, who have a higher-than-average risk, and because we have internal administrative data from the cooperating firm we have information on even very slight accidents (e.g. breaking a rear view mirror), which are also of higher incidence. We are able to use the firm's categorization of accidents by potential severity, and show that having an accident of the lowest potential severity, which has a relatively high frequency, is predictive of having one that is more potentially serious. Using these data we explore the relative power of our measures of differences in exposure and differences in individual driver characteristics to predict accident occurrence among our sample. Several specific exposure differences and some personality characteristics emerge as the strongest predictors.

Rural Safety, Health, and Emergency Response

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In response to the SAFETEA-LU legislative mandate to assess local community needs in order to improve access to mobile emergency treatment, researchers from the Center for Excellence in Rural Safety focused on technological developments affecting rural safety and the issues surrounding their deployment. In collaboration with the Mayo Clinic, researchers analyzed emergency processes and data and the flow of information in order to understand system performance across informatics providers (e.g., OnStar), 9-1-1, medical dispatch, emergency responder, and trauma center organizations. Their goal was to develop an information framework that could act as the "gold standard" for end-to-end information about the patient, the nature and type of accident, health care interventions provided on the scene, specialties and capabilities of care centers, availability of resources, and system performance. This work helped lay the foundation for more advanced information systems that will enable more efficient use of emergency resources, better medical decision-making in the field and in the hospital, and improved emergency response in rural areas. This research builds on several years of prior research sponsored by the National Science Foundation (NSF Award #0535273), as well as the Center for Transportation Studies (CTS) and the Intelligent Transportation Systems (ITS) Institute at the University of Minnesota, and the project's findings will aid in the development of a set of national implications.

Crosstown Commons

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The Minnesota Department of Transportation's I-35W/TH 62 Crosstown Commons is being hailed as a success in design and construction. The numbers speak volumes about the magnitude of the project's design: reconstructing 4 miles of interstate 35W and 2 miles of highway 62, 9 interchanges, 26 bridges, 10 miles of retaining wall, 8 miles of noisewalls and over 15 miles of storm sewer pipe ranging from 8" to 120". The design introduced the region's first in-line median bus rapid transit station and the expanded MnPASS managed lanes to I-35W. Constructing the new 12-lane "commons" section was complicated by the project's tight physical location in established neighborhoods and the need to keep the heavily traveled interchange open to users. The new multi-level, urban freeway offers commuters safer travels and shorter commute times.

As part of this presentation, John will share his experiences, the good, the bad and the ugly as it relates to the communications and the difficulties of building a project that had many challenges from the start.

Twins Stadium

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The new Twins Ballpark represents 13.5 acres of program built on an 8 acre site. The Ballpark is about 3 feet away from Ramp B, over several lanes of 394, touches the 7^{th} and 5^{th} Street Bridges, has structure over a bicycle trail and commuter rail line and next to an active freight railroad line. During the 4 year construction process it was critical to communicate in a timely and effective way with people likely to be affected by construction activites.

This presentation will cover the basics used in the Ballpark construction process of:

- Audience Identification
- Communication Methods
- Techniques for Getting Out Timely Information
- Public Contact Examples from the Project

Central Corridor

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Review simple and low cost strategies that can be used to communicate with the public throughout a complex public works project. Session will include lessons learned during the engineering phase of the Central Corridor LRT project and strategies being used to keep a diverse community informed about construction activities, schedule and impacts. Strategies include webpages, social media, visualization tools and advisory committees.

Innovative Parking Pricing Study

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The State and Local Policy Program at the Humphrey School of Public Affairs has been involved in pricing projects for more than ten years. Commuter parking sites in downtown Minneapolis have the potential to be an excellent testing ground for demonstration of pricing mechanisms. When downtown commuters buy into a monthly parking contract, either individually or through their employers, they have little incentive to use transit on days when it fits into their schedules—they are "married" to their drive-and-park routines. The Innovative Parking Pricing Demonstration project explores what happens to commuter behavior when flexibility is introduced to parking contracts. The principal goal of this research is to demonstrate an innovative pricing strategy in the Twin Cities to determine whether monthly parking contracts prevent downtown Minneapolis commuters from using transit. A secondary research objective is to determine commuters' tipping point for price acceptability in bundling flexibility into their commuting package.

The demonstration consists of running three different test modules and a control module during two four-month periods. The purpose of the control module is to help identify which elements of each module (if any) seem to have the greatest impact on behavior. The test modules are:

Module I: Buying Flexibility - This module is marketed toward current parking contract customers who are considering transit. Participants sign up for a deeply discounted (\$20, per month or roughly the equivalent of 8 round trips per month) transit pass bundled into their parking contract.

Module II: Marginal Rebate - This module provides participants with a free transit pass and refunds participants the difference of the marginal parking cost and transit fare on days when transit is used. For example, if a commuter's daily marginal parking cost is \$8 and the cost of a round-trip transit fare is \$6, the commuter will receive a \$2 rebate for each day transit is used.

Module III: PAYGo Flex-pass Rebate - Participants receive a free transit pass at the beginning of each month as long as they keep a valid non-carpool contract. In addition, they receive a "credit" for the amount they pay for the contract. They are charged \$8 against the credit on days they park and \$6 against the credit on days they take the transit. Nothing is charged on days they telecommute, bicycle or walk to work. Participants who use less than their credit during the month will be able to take what is left as a rebate, up to half the cost of the monthly parking permit. No participant will be charged additional fees, even if the cumulative marginal costs of their monthly travel exceed what they paid for the monthly parking pass.

Test Module I of the study was completed in July of 2010. The initial findings suggest that even the deeply discounted transit pass (\$20) is still too expensive to be appealing to parking contract holders. Additionally, a variety of descriptive and attitudinal data was collected about the parking contract holders from a survey that was a part of this first module. Modules 2 and 3 are currently underway and are anticipated to be complete mid-January. Preliminary findings from these modules will be available for presentation at the conference in May.

MnPASS System Study Phase 2

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Completed in September of 2010, the MnPASS System Study Phase II analyzed and made recommendations for where the Twin Cities MnPASS Express Lane system could be expanded over the course of the next two to 10 years. MnPASS System Study Phase 2 updated an earlier 2005 MnPASS System study, and was based on:

- Proven MnPASS ability to safely provide increased trip reliability as well as user choice in a cost-effective manner
- New low cost MnPASS design options (as demonstrated in the Interstate 35W MnPASS project)
- Met Council support for continued MnPASS/Managed Lane implementations

Results

MnPASS System Study Phase 2 recommended a number of opportunities for the next generation of MnPASS managed lane projects in the Twin Cities metropolitan region. These opportunities were ordered in tiers, from short (tier 1) to longer (tier 3) term, and included:

Tier 1

• I-35E between I-94 and Highway 36 between St. Paul and Little Canada (Part 1 of an I-35E MnPASS lane)

Tier 2

- I-35E between County Road E in Vadnais Heights and Highway 36 (Part 2 of an I-35E MnPASS lane)
- Highway 36 Eastbound only between I-35W and I-35E
- I-35W from downtown Minneapolis to TH 36 (Phase I) and between TH 36 to Blaine (Phase II)
- I- 94 between St. Paul and Minneapolis

Tier 3

- I-494 between Highway 212 in Eden Prairie and I-394 (operated as a Priced Dynamic Shoulder Lane during a.m. and p.m. peak periods only), and between I-394 and I-94 (operated as a more typical MnPASS lane)
- Highway 169 between County Road 17 in Shakopee and I-494
- Highway 77, northbound only, from 141st Street in Apple Valley and Old Shakopee Road in Bloomington
- I-494 between Highway 212 in Eden Prairie and the Minneapolis/St. Paul International Airport

The selection process involved several "screens", including high-level geometric screening, performance evaluation against a number of performance measures, including travel time reliability, throughput, travel time reduction/average trip time, change in congested VMT and transit suitability (daily bus volumes, peak bus volumes, existing bus-only shoulder lanes, future plans). Additionally a financial analysis was conducted.

Yet to be resolved are a number of policy issues that need careful consideration, analysis and stakeholder input as the MnPASS system expands. These include:

- Establishing regional consensus on the purpose of MnPASS Express Lanes e.g., will they be implemented to manage traffic congestion or generate revenue
- Ensuring equitable treatment of travelers across the region
- Working with the Federal Highway Administration to further the development of safe and cost-effective managed lane designs

Mileage-Based User Fee Demonstration and Policy Study

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There has been increasing interest in Minnesota and other states in exploring the potential for mileage-based user fees (MBUF) as a means to fund transportation infrastructure and operations in the future. This has particularly been the case with the decline of the fuel tax as a revenue source with more fuel efficient cars and electric vehicles that won't pay the fuel tax and with persistent political opposition to fuel tax increases. There is the potential that a mileage-based revenue system could be more equitable and transparent than the current financing system, linking charges for roads more directly to usage and external costs such as congestion and environmental effects. However, the policy and technical steps toward planning, deciding and implementing such a system are complex and will require a significant, long-term outreach, education and communications effort with the key stakeholders public.

A policy examination project is being conducted in coordination with the Minnesota Department of Transportation's (Mn/DOT) IntelliDriveSM for Safety, Mobility, and User Fee Project (ISMUF) demonstration project. The University of Minnesota's Hubert H. Humphrey School of Public Affairs has been retained as the contractor. The goal of the project is to identify and engage a Minnesota policy taskforce, with the intent of resolving issues with and articulating benefits from potential implementation of mileage-based user fees (MBUF) in Minnesota.

In 2007, the Minnesota State Legislature directed the Minnesota Department of Transportation (Mn/DOT) to conduct an MBUF pilot project. Through this effort, Mn/DOT desires to explore the policy and institutional issues associated with demonstrating an MBUF system. Through a strategic, robust and deliberative process, the U of M team's proposed approach will in the short term be a valuable tool to inform Mn/DOT's technology demonstration test. Just as important, the stakeholder engagement process will in the long term lay the groundwork for a better informed and more balanced policy debate about the merits and challenges for statewide MBUF implementation.

The scope of this project is intended to expand the knowledge and discourse by building upon existing sources of market research in order to inform and engage key stakeholders with meaningful and substantive information. It is proposes that additional market research will be conducted, including individual and small group interviews as well as larger community discussion, workshops, and seminars. Significant effort will be made to reach out to rural Minnesota voices and perspectives through a series of five Greater Minnesota Community Discussions. In addition, a three-part series of Rethinking Transportation Financing Roundtables will be convened in the Twin Cities Metropolitan Area. These efforts will be supplemented by targeted legislative and executive briefings to ensure that key policy makers at the state, regional and local levels are kept informed throughout the process.

Mn/DOT's Complete Streets Policy

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Minnesota's State Highway Commission was created in 1905 and abolished in 1917 when the Minnesota Legislature created a Department of Highways. The organization of the Highway Department reflected the need for a roadway system able to handle the growing numbers of motor vehicles. Mn/DOT, or the Minnesota Department of Transportation, was created in 1976 by the Legislature to assume the activities of the former Departments of Aeronautics and of Highways and the transportation related sections of the State Planning Agency and of the Public Service Department. Today Mn/DOT develops and implements policies, plans and programs for aeronautics, highways, motor carriers, ports, public transit and railroads. In 1978 a Mn/DOT's Bike unit was established. This session will talk about Complete Streets and what Mn/DOT has been doing to incorporate it into its business.

A New Route to Complete Streets? Using the TCAPP Model in Grand Rapids, Minnesota

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In the fall of 2010, the Minnesota Department of Transportation received funding from the Strategic Highway Research Program (SHRP-2) to utilize a new transportation planning model for planning and implementing Complete Streets in Grand Rapids, Minnesota. The model, entitled, "Transportation for Communities: Advancing Projects through Partnerships" (TCAPP), focuses on achieving widespread participation and support in the development of transportation plans.

The City of Grand Rapids is in the late stages of completing its Comprehensive Plan, and the community recently supported research into methods for improving transportation for disadvantaged populations. In both cases, participants indicated strong support for implementing policies that support Complete Streets and other multi-modal options. As such, many pieces are in place to test the effectiveness of the TCAPP model as planning for Complete Streets moves forward in this community.

This presentation will be a "progress report" on the creation of the Complete Streets plan, and a summary of initial lessons learned regarding the tools developed for the TCAPP model. The former is being work is being led by Mn/DOT and several partners. The latter is part of a related evaluation of the TCAPP model conducted at the University of Minnesota's Humphrey School of Public Affairs.

Planning with Parks and Trails in Mind: Overview of and Implications from the 2011 Parks and Trails Planning Framework

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Others: Brian Schreurs, GIS Analyst; Andrew Oftedahl & Alex Smith, Research Assistants

Legislative Charge: The Center for Changing Landscapes, University of Minnesota was directed by the Minnesota Legislature to create an inventory and a long-range framework for an integrated statewide *natural resource-based* parks and trails network that included a geodatabase inventory of existing regionally and statewide significant parks and trails and a social science analysis that identified recreational trends and demographic changes, underserved areas, overused facilities, gaps in the current park and trail systems, and opportunities for enhancing existing assets, developing new assets, and linking those assets together effectively within realistic financial resources.

Framework Priorities: The set of planning priorities that guided opportunity selection included: 1) Minnesotans' access to diverse, high quality recreation opportunities must be evaluated in the context of the federal, state, regional, or local authorizing legislation that established them; 2) Minnesota's Network of Parks and Trails should be managed adaptively to ensure its long-term sustainability with respect to the protection of natural and cultural resources, the facilitation of high quality recreation experiences, and the advancement of stewardship behaviors among Minnesotans; 3) A variety of complementary outdoor recreation settings and linkages between should be maintained across Minnesota's diverse landscape base that contribute to the high quality of life in Minnesota and support diverse recreational experiences; 4) Opportunities for high quality recreation experiences should be created, monitored, and sustained through careful consideration of recreation settings, activities, experiences, benefits, and constraints; 5) Minnesotans' access to recreation opportunities must be evaluated in light of the state-wide, regional and local supply including the abundance, quality, and distribution of parks and trails and the natural resource base that supports them; 6) As Minnesota's population grows and settlement patterns shift, addressing how these population dynamics will affect demand for and access to diverse, high quality recreation opportunities will be essential; 7) As Minnesota's population diversifies, monitoring and meeting the needs of multiple population subgroups will be critical because these groups vary in the recreation settings, activities, and experiences they prefer, as well as the constraints they face; 8) Impacts and potential threats to Minnesota's Network of Parks and Trails should be monitored and assessed across three setting components: (a) the natural environment, (b) the social environment, and (c) the built and managed environment.

Data Challenges and Opportunities: Common challenges across data types included coordination, lack of information, lack of comparability across data sets, as well as data recency. This work created coordinated maps and tables for use by state and local decision-makers in planning and funding park and trail projects.

Transportation Implications: The inventory and the framework provide tools for integrating recreation and transportation system planning. The trend analyses and the databases have relevance for use by many public bodies.

Cyclopath and Cycloplan: Collaborative Bicycle Planning and Routing

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Cyclopath (<u>Cyclopath.org</u>) is an interactive bicycle routing site (currently) for the Twin Cities metro area. Cyclists can get routes over bicycle paths and roadways. Cyclopath is a *geographic wiki*. It does for map-based web sites what Wikipedia did for textual web pages: all of the site's content is user-editable. In addition to entering textual notes, points of interest, and ratings, users can edit the road and trail network. Cyclopath has been publicly available to Twin Cities cyclists since August 2008 and has over 2300 registered users. Users have entered over 70,000 ratings and made over 10,000 edits to the map. Each day during riding season, several dozen registered users and a hundred or more anonymous users visit the site and request more than 150 routes.

We are collaborating with agencies like the Metropolitan Council and the Minnesota Department of Transportation to enhance and extend Cyclopath. With the Met Council, we are creating *Cycloplan*, a set of extensions to Cyclopath to support transportation planners in planning new bicycle trails, communicating with the public about their plans, and receiving input from the public. Local government transportation planners want to build bike paths where they are most needed. Cyclists want to provide feedback on these plans. Cyclists and walkers want to let government officials know about problems like rough patches on bike trails, unplowed trails, unsafe intersections, etc. Such communication is possible today, but it isn't easy. For example, who do you call when a snowplow has left a bike lane covered, thus making a safe cycling route unsafe? You would have to find the web site for the community you live in, search for the relevant department for the specific problem and neighborhood, and then look for a telephone number. However, we can include in Cyclopath the contact information for the responsible government officials for cycling-related issues in all regions of the metro area. Finding the right person will be as simple as clicking on the segment of road you're interested in.

In addition to collaboration between transportation planners and the public, we also are creating new functionality to support "What if" analysis by transportation planners, for example: "What if I build a new bicycle path here? What will the effect be on cycling?" We can answer such questions because (a) Cyclopath is a wiki, so every state of its database is saved, and (b) every route request ever issues – well over 60,000 at this date – has been saved. Thus, we can compute how many route requests would receive new routes and whether the new routes would improve over previous routes (in both distance and quality).

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Cycloplan is a new bicycle system planning tool developed by researchers with GroupLens Research at the Department of Computer Science at the University of Minnesota for the Metropolitan Council. Cycloplan is itself an extension of the online trip planning resource Cyclopath with which bicyclists can plan potential trips based on road and trail suitability ratings partially customized by user preferences and user-generated information about the condition of roads and trails for cycling. I will discuss the various features of Cycloplan and how they can be of use to planners and other transportation professionals in improving bicycle system connectivity, safety and public involvement.

Blatnik and Bong Bridges Suspender Replacement: Maintaining Minnesota's Unique Bridge Inventory

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Previous bridge inspections identified corrosion and other condition issues with the suspenders that support the main span bridge decks of the John A. Blatnik and Richard I. Bong Memorial Bridges located between Duluth, Minnesota and Superior, Wisconsin. The Blatnik crossing is 7,975ft long with the main span consisting of a 600-ft arch truss with a 600-ft arch span. The Bong Bridge is an approximately 11,800 ft crossing with a main span consisting of a steel tied arch with a 500-ft span. With major bridge preservation efforts programmed for both bridges in 2012, it was determined that a detailed assessment of the condition of the wire ropes and sockets on the Blatnik Bridge and the helical wire strand and sockets on the Bong Bridge was warranted. This would provide Mn/DOT and WisDOT information to determine if replacement of the wire ropes is needed to extend the service life of these two major and unique structures.

A construction contract was executed to remove two suspenders from each bridge and have them tested destructively to determine their modulus of elasticity, ultimate strength and overall rope and socket condition.

This presentation will discuss the configuration and existing condition of the suspended deck system, the removal and replacement procedure, the results of the testing and the maintenance recommended to extend the service life of the two bridges.

Historic Approval of the Dunn Bridge Replacement

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We are often faced with the decision to recondition or replace old, sometimes historic, crumbling infrastructure. That was the case for the Dunn Bridge in the City of Princeton. The statewide historical inventory of local and state bridges identified that the Dunn Bridge, a structure owned and maintained by Mille Lacs County, was eligible for the National Historic Register. The Dunn Bridge was also identified as structurally deficient and functionally obsolete. Significant structural issues would have to be overcome in order to continue operating as a safe Rum River crossing for the residents of Princeton and travelers using County State Aid Highway 29. In order to work in the river, a federal Section 404 permit was needed which required Section 106 of the Historical Preservation Act, review and approval, from the Army Corps of Engineers. During project development, it was realized that this approval would need to occur quickly since the construction season and project letting was approaching and the removal and replacement of this bridge was linked to adjacent bridge removal in town. These removals would result in the city being severed with no river crossings for seven months and a detour of over 10 miles to get from one end to the other. Failing to receive this permit was not an option. Design features incorporated in the new bridge, analysis used to justify replacement, and mitigation will be discussed, as well as the lessons learned regarding schedule and process required for getting through the often lengthy and rigorous Section 106 review.

Historic Bridge Rehabilitation Strategies - Three Project Examples

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There are roughly two hundred historic bridges in Minnesota and 85% are owned by cities and counties. Often before funds can be released for a transportation improvement project involving a historic bridge, the owner is required to explore the feasibility of rehabilitating the existing structure. Often these bridges have limited plans available and have undergone substantial changes over the years. To complicate the matter even further, historic bridges often have unique characteristics that make it difficult for owners to know what options for rehabilitation are available to them. Using laser scan video clips and animation, this presentation will describe rehabilitation strategies used for three different historic bridge projects. The rehabilitation of an 1870s wrought iron through truss owned by Mn/DOT, a 1910 C.A.P. Turner concrete arch owned by the City of Saint Paul, and 1916 concrete tee beam bridges owned by the City of Minneapolis will be described.

Segmental Bridge Abutment Design Using Solid Finite Elements

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WSB and Associates teamed with Figg Engineering Group to design the concrete option for the Lafayette Bridge in St. Paul, MN. Our main task was to design the reinforced concrete bridge abutments. One of our challenges with the segmental concrete bridge substructure design is that the load from the superstructure is distributed from only two or three bearings near the center of each abutment. These concentrated loads distribute loads unevenly to the piles resulting in underutilized piles at some locations if a two dimensional analysis is performed. Our design utilized a three dimensional solid finite element model to predict the distribution of the loads from the bearings to the piling. The results of our design enabled us to accurately model the loads in each pile. This enabled us to add additional piling at specific locations to better distribute the loads between piles. The results were compared to a more traditional two dimensional model which distributes the load evenly between two rows of piles.

Traffic Performance Measurements Using Event-Based Detector Data – Recent Developments on the SMART-SIGNAL System

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It has been demonstrated that, through the prototype of the SMART-SIGNAL system, more accurate traffic performance measures for both urban arterials and freeways can be obtained using event-based detector data. This presentation summarizes the lessons learned in the past development of the SMART-SIGNAL system, and discusses the ongoing and planned activities, as well as the implementation plan.
Statewide Traffic Flow Data: Probe Vehicle Study for Iowa DOT

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The collection of real time traffic information is gaining importance as both state and local agencies attempt to provide accurate traveler information to the public. Furthermore, if approved, the Real-Time System Management Information Program described in SAFETEA-LU Section 1201, will require all states to establish a system of basic real-time information for managing and operating transportation systems. Typically, traffic flow data has been collected by in-pavement loops or other on-site sensors. Although they are accurate, these methods are expensive to deploy and maintain on a statewide level. Location and speed information obtained from mobile probes offers a new paradigm for monitoring traffic because little or no roadside infrastructure is required.

A feasibility study conducted by the Iowa Department of Transportation examined the needs and opportunities for the State of Iowa to collect traffic flow information using probe-vehicle-based systems. Traffic data service providers were assessed for their suitability to accurately report vehicle speeds and/or travel times on roadways throughout the state. These service providers typically use one or more of the following sources for real-time traffic flow information: cellular phone providers, fleet vehicles, and roadside sensor data as made available by public agencies. The study explored the relevant technologies and vendors, conducted a literature search, and interviewed state Departments of Transportation (DOTs) throughout the country to determine the current state of the practice. The study presents the lessons learned from prior deployments explores the feasibility for the State of Iowa.

Arterial Travel Time Characterization and Real-Time Traffic Condition Identification Using GPS-Equipped Probe Vehicles

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Monitoring and predicting traffic condition on signalized urban arterials has been one of the biggest challenges in transportation engineering. In this study, a method of arterial travel time estimation based on multicomponent mixture models and Markov Chain is presented. In addition, combined with travel time data collected from GPS probe vehicles, a real-time traffic condition identification approach based on Bayes theorem is proposed. A preliminary calibration under two different traffic conditions of the proposed method using NGSIM data is also provided. Results suggest that the proposed method can characterize the travel time of an arterial link well and provide an accurate estimation of route mean travel time. Also a single GPS probe was able to identify real-time traffic condition successfully in most cases.

An Engineering Approach To Writing: A Pilot Program For Civil Engineering Graduate Students

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This presentation describes a pilot program established to promote excellent communication skills for civil engineering (CE) graduate students through an extra -curricular communication pedagogy effort. The presentation reports on activities that established the program, including identifying key contributors identifying student participants, and defining expectations and desired outcomes. The presentation also discusses key elements of the program including: initiating a collaboration between a technical communication professional and a CE faculty member; identifying common communication issues; developing effective writing strategies and tools (e.g., templates, problem statement worksheet); designing and using a calendar for accountability and team building; creating custom handouts for rapid responses to student needs; and organizing group workshops, one-on-one writing coaching sessions, and structured peer reviews.

The authors have identified and will report on three processes for assessing student performance and two processes for evaluating the pilot program.

- Assess drafts at several stages to ensure that students are on track with project deadlines and that they understand their research and communication tasks in a CE context.
- Facilitate review of the quality of students' written and oral communication to assess the effectiveness of interventions.
- Survey group workshop participants and conduct follow-up interviews with students who attended the majority of the sessions and students who attended only once or twice.
- Facilitate program review by student participants, research staff, CE faculty, and technical communication educators.
- Analyze the time required to develop effective communication skills and assess how to integrate that time in or as a complement to CE curricula or research projects.

This presentation should be of broad interest to the engineering education community because "to be an engineer is to be a technical communicator. Engineering is a problem-solving profession and clear communication leads to effective solutions" (Hart 2009, 1). Further, both the American Society of Civil Engineers BOK II (2008) and ABET (2008) stress teaching technical engineering skills and communication skills to prepare students for professional practice because employers in both industry and academic settings consistently rank technical ability and communication and teamwork skills as the most desireable proficiencies.

E-Jam and Tech Connections: Mn/DOT Crowdsourcing, Collaboration, and Social Media for Research and Innovation

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Our topic is important because we actually used collaboration ideas and tools to gather employee ideas from all levels of the organization as the basis for the initiatives. We feel that other departments and organizations can use our experience as a model to help improve idea gathering and implement social media and collaboration strategy, policy, risk management and implementation practices.

- 1. In September 2009, Mn/DOT hosted an online employee idea gathering event titled 'E-Magination JAM,' which was based on IBM's Innovation Jam model.
- 2. Of the 500+ ideas that were collected from the E-JAM, 80+ technology ideas were grouped into a new Mn/DOT Flagship Initiative called Tech Connections.
- 3. Tech Connections manages ideas that support Mn/DOT's organizational strategy by assessing risks, informing policy decisions, and implementing ideas.

Best Practices: Managing Interaction between Local Authorities and Major Traffic Generators

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The Local Road Research Board recently funded the development of an online document that presents guidelines for Minnesota county engineers on how to interact with developers of "wind farms" (technically known as large wind energy conversion systems or LWECS) regarding road-related issues. Construction of LWECS requires hauling of a significant number of heavy loads on local roadways, potentially causing damage to the roadway surface. This document provides county engineers with guidance on how to work with LWECS developers to preserve the roadway surfaces. The committee that provided input for this document was comprised of Minnesota county engineers that are currently going through or have completed this process. It includes sample documents, experience from current or past projects, research information and a calculator to quantify the impact of traffic on roads. County engineers in other states, other road authorities, and wind power developers themselves also may find this information valuable. While this tool is focused on LWECS's, it is broad enough that it could also be used when a county is dealing with any other enterprise that impacts the roads under its jurisdiction.

This presentation will guide the audience through the use of the electronic interactive PDF and will educate them on how they could use this tool within their agency.

Developing a 50-Year Vision for Transportation in Minnesota

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In 2011, Mn/DOT will facilitate development of a 50-year vision for transportation in Minnesota. The vision will form the foundation of the next statewide multimodal transportation plan. The process for soliciting a wide range of inputs will be discussed, including the use of advisory groups, scenario planning, online interactive forums, digital briefings, social media and other engagement techniques. Early findings and emerging trends will be presented. In addition, the rational and intended outcomes of the visioning process will be covered. This effort is part of an ongoing initiative to transform the department into a truly multimodal agency.

Determining Costs and Environmental Performance of Conventional and Alternative Vehicles

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A web-based decision tool was developed to guide consumers in their efforts to determine the costs of ownership and operation as well as the environmental performance of alternative vehicles. Users of the tool can apply their assumptions for vehicle cost, income tax credits, miles per gallon or miles per kilowatt-hour for either conventional, hybrid, electric or extended range electric vehicles. Then they must make assumptions about the miles per year to be driven and perhaps the number of miles driven using battery power. Consumers need to consider the price of gasoline, electricity, engine maintenance, and their own discount rate over the life of the car. And they can apply the amounts of greenhouse gases (GHG) emitted in the creation, delivery and use of those sources of energy from identified sources and locations in the country.

Graphs are generated that show the accumulated discounted costs of ownership and operation of the four types of cars and tables are generated for comparison of monthly costs for ownership and operation. Greenhouse gases are calculated for each type of vehicle so that consumers can determine relative GHG emissions as well as the levels of "self-assessed" CO2 taxes. By altering the assumptions, consumers will recognize the sensitivity of results to such factors as vehicle cost, miles per gallon, gasoline price, miles driven per year and the impact of tax rebates. Consumers are offered more choices of vehicles these days, and this web-based tool helps them organize their thinking to make prudent financial and environmental decisions.

Transporting Solid, Liquid, and Gaseous Forms of Energy in North America

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There is broad scientific consensus that biomass crops and residues can replace fossil fuels, which should decrease the need to import petroleum, decrease greenhouse gas emissions and extend the life of the world's limited fossil fuel supplies. The United States is committed to expanding the role of biomass as an alternative energy source both to decrease imports of oil and gas and the production of greenhouse gases as well as fostering the growth of agriculture, forestry, and rural economies. The Energy Independence and Security Act of 2007 mandates the production of 136 billion liters of renewable fuels by 2022 including 79 billion liters of advanced biofuels and cellulosic ethanol. (In addition to transportation fuels, biomass can be used to generate electricity or steam.) Lofty goals and hopeful statements however, can eventually fade or even disappear when exposed to the big picture of real world economics.

During the past several years, research and development activities have focused on the mechanics of the collection of agricultural crop residues and dedicated agricultural biomass crops for use in energy and biofuel production. These efforts, for the most part, have been technically successful at the field and farm level.

However, it will also be necessary to develop new methods and systems to routinely and reliably store, transport, and handle large quantities of bulky materials of varying characteristics. These needs contrast with the well-developed logistics, grading, and marketing systems for grain biofuel feedstocks and fossil fuels. There have been a number of research activities aiming at providing solutions to specific unit processes within the feedstock provision value chain. This paper reviews these biomass logistics requirements and some of the projects that have been initiated for effective logistics systems from field to processor for energy crops. We report some results from two types of field level case studies. These case studies show that substantial efforts have been made towards the development of machines for harvesting and collection of agricultural biomass. These case studies show that substantial efforts have been made towards the development of agricultural biomass. But the case studies also demonstrate that continued research and innovation are needed to develop the reliable and cost effective infrastructure necessary to meet the nation's ambitious goals for energy from cellulosic biomass.

Transporting Electrons for Vehicles: Adapting the North American Grid for Electric Vehicles

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This talk will center on the issue of whether the incorporation of large numbers of electric vehicles – either plug in hybrid or all electric – will cause major problems for the electric power infrastructure in the United States. The main issues that appear to confront the power system are whether the charging of electric vehicles will mean so much added stress on the transmission and distribution systems that major additions will be necessary to support a large electric vehicle fleet. In fact, many authors and government agencies have written research reports on this subject and their conclusions are usually positive. Further, large numbers of electric vehicles may have a beneficial effect on the electric power system and bring benefits that no other form of electric load shows.

2010 Twin Cities Transit On-Board Survey Results

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From September-November 2010, the Metropolitan Council, as part of the 2010 Travel Behavior Inventory, conducted an on-board survey of travel patterns in the Twin Cities transit system. The survey studied 108 routes on the system, representing 80% of daily ridership. Rail and bus routes were selected for study if they had experienced significant changes in ridership, were in corridors which included an existing or future FTA New Starts or arterial transitway project. Northstar commuter rail was surveyed in this fashion for the first time. Over 10,000 records were collected on ridership patterns of riders on a route level, collecting data on boarding/alighting and origin/destination, mode of access, trip purpose, and demographic information. This data will be combined and weighted with survey data from the most recent survey in 2005 and used both to inform future system planning and to calibrate the regional travel demand forecast model. The presentation will discuss survey methodology; new techniques and lessons learned, as well as present initial key findings from the data.

Measures of Urban Trail Use in Minneapolis

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The objective of this research is to validate infrared counting technology for use on multiple trail sites in the Minneapolis area and obtain an understanding of the factors that affect trail usage, including weather, seasonality, neighborhood socio-demographic and environmental characteristics, and trail characteristics. Manual bicycle and pedestrian counts have been conducted by students and volunteers in conjunction with infrared counting technology in order to determine the inherent error in the infrared counters and provide confident estimates of actual counts. Potential factors affecting trail use have been regressed on adjusted daily counts to determine whether factors are statistically significant.

To date, 126 hours of validation counts have been conducted at three urban trail locations. A linear relationship between infrared counts and manual counts has been established with an R² value above 0.99. A quadratic relationship has also been established that may better account for estimates at low volumes. A step function may also be appropriate. Factors that have been found to affect trail usage in a significant fashion include temperature, precipitation, location, day of week and month. This validation can be used to deploy additional counters at future locations, both in Minneapolis and elsewhere, with minimal validation and confidence in results. Estimates of trail usage at specific locations can also be utilized by public agencies for a variety of different applications, including traffic signalization decisions, maintenance scheduling, and prioritization of facility improvements.

The Greater Minnesota Transit Investment Plan

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In 2009, the Minnesota legislature mandated the Greater Minnesota Transit Investment Plan in S. F. No. 2540, 6th Engrossment. Completed in early 2011, the goals of the Greater Minnesota Transit Investment Plan were to determine total transit needs in Greater Minnesota, estimate the cost to meet 80 percent of identified need by 2015 and 90 percent of identified need by 2025, and build support for investment priorities in scenarios of static, increased, or decreased funding for public transit.

This planning process utilized new techniques for mathematical modeling and strengthened public outreach efforts that enhanced the quality of the final plan. During technical analysis, Mn/DOT and consultants from SRF and Richardson, Richter and Associates developed a new model, called the Minnesota Hybrid Model, to calculate future demand for transit service in Greater Minnesota. In addition, Mn/DOT teamed with Regional Development Commission planners to conduct extensive public outreach at the local level. Public outreach activities included an "Investment Priority Activity," in which participants were given money and asked to "spend" their limited dollars as a means to indicate their preferred investment alternatives. The innovations used in this planning process demonstrate how mathematical modeling and public outreach can be integrated into planning activities to produce a high-quality final plan.

Performance of Swale in Infiltrating Stormwater Runoff and Rapid Infiltration Measurements in Swale

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Infiltration is the primary means of Swales or drainage ditches to reduce the peak runoff volume of stormwater and to remove pollutants. As stormwater runoff travels through the swales, vegetation reduces peak velocity while infiltration reduces flow volume. Measurements of the infiltration rate applied to a design storm are needed to determine performance, schedule maintenance and meet regulatory requirements for stormwater control of Swales and other Best Management Practices. Infiltration rates, however, have great spatial variation, and infiltration measurement techniques are relatively slow. This presentation will discuss a case study which will show the amount of infiltration of the stormwater runoff that comes into a swale for different rainfall event. The presentation will also introduce a new infiltration measurement method that is fast, simple and inexpensive, therefore suitable for infiltration practices because it can be performed relatively quickly to capture the large spatial variability that occurs with infiltration rates. The device associated with the method is named Modified Philip-Dunne (MPD) infiltrometer. This device facilitates the measurement of Saturated Hydraulic Conductivity and wetting front suction of the surface soil. The MPD infiltrometer is currently being used to characterize the infiltration properties of swales and has been used extensively to characterize the infiltration properties of several LID best management practices, such as rain gardens and infiltration basins. This method, developed for field application, has a simple experimental apparatus, straight-forward mathematical model and requires a minimal volume of water to perform the test.

Environmental Constructability in Motion

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Objective

This presentation will discuss development of narratives, detail sheets and plan locations as a communication tool for delivering Federal and Minnesota environmental commitments and best management practices for field implementation of bridge and culvert removals and reconstruction. The goal of the presentation is to highlight research opportunities for managing all pollutant sources and proper field prevention implementation during construction

Methodology

Typical gap analysis during plan review indicates a disconnect between predesign promises, public and agency commitments, and final plan development 'shovel-ready' for construction. The common item missing are design details and project owner expectations communicated clearly through the bid documents of how the work could be performed and remain consistent with Federal, State, and local rules and regulations.

Results

Project case studies and NPDES storm water pollution prevention plans will be presented that show means and methods for context sensitive designs, multimodal trails, gas and other utility construction through wetlands and lake edges, historic designated restoration of walls, river conveyance, and other public facilities, and flood management through the context of linear construction activities.

Policy Implication

The audience will learn how a construction plan should be created that includes at least one biddable and buildable means and methods for every expected stage and phase of the proposed bridge or culvert work. The presenter will answer the question of whether the ultimate project owner can and should direct the work of the prime contractor when working in and over public waters.

Pervious Concrete Pavement

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Pervious concrete pavements have been used extensively for stormwater management in the warm regions of United States since the 1970s but have been introduced in northern states in the last decade where pervious concrete pavements have not been consistently durable. In a recently study sponsored by the Ready Mix Concrete Research and Education Foundation, the durability of 22 pervious concrete pavement sites in a wet, hard freeze region of the United States were assessed. As part of the study, 33 cores were taken for microscopic and thin section analysis. The visual assessments resulted in identification of typical pervious concrete pavement surface distresses including impermeability, surface raveling, deep raveling, and joint raveling. Optical microscopy of the pervious concrete cores identified subsurface cracking patterns through paste, aggregates, and the paste/aggregate interface. Thin section analysis of distressed and non-distressed in-service pervious concrete samples revealed that the paste of the non-durable pervious concrete samples was extensively carbonated while only a thin layer of cement paste was carbonated around the voids in the durable samples. The information gathered from these observations indicated that the durability of pervious concrete is highly affected by the degree of hydration of the cement paste which is influenced by environment, construction, and curing.

Don't Hurt the Turtle: Resolving Conflicts of Natural Resource Regulations

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Natural resource regulations are sometimes at conflict with transportation plans and projects. While this is expected on occasion, sometimes the message from resource regulators is inconsistent and confusing. This presentation will give examples of potential conflicts between or within regulatory agencies, and how early involvement in transportation planning can alleviate these issues throughout the design and construction processes without adding significant cost or time to a project. Mn/DOT has benefited from early involvement with several resource regulatory agencies, resulting in the development of projects without delaying completion. One such early coordination agreement is with the Minnesota DNR. Through this agreement, a comprehensive guidance manual for meeting Minnesota DNR concerns has been developed to provide a consistent message. This presentation will give brief overview of the early coordination process and the use of the guidance manual in planning, design, and construction.

Environmental and Fuel Economy Benefits of Higher Productivity Commercial Vehicles

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Rising fuel costs, increasing pressure to reduce emissions and tightening capacity have all generated new interest in changes to federal truck size and weight regulations. The American Transportation Research Institute (ATRI) investigated the potential fuel savings and environmental impacts of expanding federal gross vehicle weight (GVW) allowances to portions of Maine's Interstate Highway System. The performance of a 6-axle vehicle configuration operating at a maximum GVW of 100,000 pounds was analyzed over two roughly parallel routes between Augusta and Brewer, Maine. One scenario reflects the current Interstate conditions where trucks with a GVW of greater than 80,000 pounds are not allowed due to federal restrictions. An alternative scenario assumes that trucks with a GVW of up to 100,000 would be allowed to travel on the Interstate; these trucks presently operate only on Maine's local and state roads that have lower posted speed limits and controlled intersections. It was found that an average fuel savings of 1 to 2 gallons per trip could be saved by using the alternative Interstate route, despite a longer travel distance. Greenhouse gas emissions were also estimated to decrease per trip by 6 to 11 percent for CO_2 and 3 to 8 percent for particulate matter, NO_x and NMHC for the alternative Interstate route. These findings may have important policy implications in Minnesota since several industries (mining, timber, agriculture and manufacturing) may benefit from utilizing higher productivity vehicles.

Truck Driver Behaviors and Crash Likelihood: Developing a Predictive Model and Countermeasures

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While truck safety has improved substantially over the years, there were still 285,987 truck crashes that resulted in fatalities, injuries and/or property damage in 2009, the most recent year for which data are available. Although considerable research has been aimed at improving safety at the vehicle and motor carrier level, more research is needed to address the fact that driver behavior is responsible for more than two-thirds of all truck crashes. Consequently, the American Transportation Research Institute (ATRI) sought to help seal this knowledge gap by analyzing which driver behaviors have the strongest association with accident proneness. In this study, 587,772 U.S. drivers were identified who had received a roadside inspection or were involved in a crash in January, February, and/or March 2010. ATRI then gathered information concerning these drivers' past violations, convictions, and crashes from January 1-December 31, 2008 as well as their crash histories from January 1-December 31, 2009. Not surprisingly, drivers who had violations, convictions, and crashes in 2008 were overall more likely to have been involved in a crash in 2009. Logistic regression was then used to develop a model displaying which specific driver behaviors are the most predictive of future involvement in truck accidents. Finally, recommendations for addressing the most problematic driver behaviors are provided in hope that they can be incorporated into current safety approaches to reduce the number of preventable truck crashes each year.

Scenic Byways and Quality of Life: Revealing Relationships Among Minnesota Residents

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Leisure travel accounts for nearly one third of all long-distance trips taken in the U.S. (30.1%; USDOT, 2010; FHWA, 2005). According to the National Survey on Recreation and the Environment, 49.7 percent (116.9 million) of the U.S. population (people 16 and older) participated in "driving for pleasure" from 2005-2009 (Cordell, 2009). In Minnesota, pleasure driving is consistently a frequently engaged in activity and, in the most recent data available, driving on scenic byways accounted for 13 percent of all travel activities (Explore MN Tourism, 2008; Gartner, Love, & Erkkila, 2002). Scenic byways are a foundation for leisure travel, providing residents and travelers with rich opportunities to learn about heritage as well as experience sensational scenic resources. Similarly, these pleasure trips generate economic impacts for the communities along and adjacent to byways. Within tourism broadly, research indicates tourism impacts quality of life. However, as Gustafson (2009) points out, there is a paucity of research related to quality of life and scenic byways. As such, the purpose of this project was to assess if and how scenic byways contributed to important elements of residents' quality of life.

Summer thru fall of 2010, onsite questionnaires were distributed to systematically selected byway travelers in two of Minnesota's scenic byways: Lake Country & Paul Bunyan. Respondents answered questions about their travel patterns, awareness of the byway and, for residents, the impact of the byway on 14 select quality of life attributes. A total of 337 respondents provided information and 282 of these were residents (198 along the Paul Bunyan and 84 along Lake Country). Descriptive and comparative analysis reveals that byways do, in fact, contribute to select quality of life attributes and may have the potential to impact several others even more. Management implications are presented.

Evaluation of the Effectiveness of an Online Transportation Workforce Development Tool

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This poster presentation will focus on the motivations and evaluation of the redesigned *Go!*, an innovative workforce development tool. *Go!* is an online magazine that was created in 2007 to attract teens and young adults to careers in transportation. It is published by the Institute for Transportation (InTrans) at Iowa State University and is the only such resource in the field of transportation. *Go!* includes information on careers and STEM articles related to transportation. In 2010 *Go!* had an average of about 4,400 unique visitors monthly. The visits were from 173 different countries, with the largest numbers from the US, Canada, UK, and Mexico. However, given the changing landscape of technology use among young adults who are highly mobile and networked, there is a need to redesign *Go!* by using technology in ways that resonate with the youth. In turn, this will enhance the reach of *Go!* to address the pressing workforce development challenge in the field of transportation

User testing was conducted on the old web site to identify isolate problems. Subsequently, graduate students from design disciplines worked on comprehensive evaluations of content, visual design, layout, and navigation. A new website has since been developed which directly addresses problems and issues noted by InTrans staff, as well as by our initial user testing. Secondary informal user testing has been performed on the new interface and website. New features include: more effective navigation, an optimized layout that enhances featured content more effectively, and more concise and exciting content. By the time of the conference, we expect to perform a formal evaluation of the web site with end users and present preliminary findings. We expect this visual transformation will assist *Go!* in enhancing its impact within its target audience and effectively increase teen and young adult's interest in transportation related careers. These findings would be beneficial to other efforts with similar goals.

Air Pollution Impacts of Conventional Versus Alternative Fuels

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The production and use of biofuels or fossil fuels releases differing amounts of air pollutants in different geographic locations at different times. Ecological and human health effects associated with these emissions impose costs on society. Emissions include greenhouse gases, which contribute to global climate change, and pollutants such as particulate matter and ozone precursors, which impact human health. For greenhouse gases, which are long-lived in the atmosphere, these costs depend on amounts released while costs associated with emissions of particulate matter and ozone-precursors depend on the amount, location, and time of release.

Current life cycle assessment is useful for determining total quantities of pollutants from producing and using fuels, but indicates little about when and where these pollutants are released. Thus, estimation of the air pollution from biofuels versus conventional fuels requires an advanced life cycle assessment that accounts for these variations in emissions and impacts. We have performed a spatially- and temporally-explicit life cycle assessment for several biofuels and gasoline.

We have evaluated the differences in predicted particulate matter and ozone concentrations by species for each of the different fuel options. We have compared both the land-area average and population-weighted average for each of the different pollutants. Our results provide new knowledge about the costs, benefits, and tradeoffs in greenhouse gas emissions and air quality that occur in switching from conventional fuels to biofuels.

What Factors Regulate the Automobile Related Negative Consequences of Alcohol Consumption in the Twin Cities Metro Area of Minnesota?

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This project investigated negative consequences of alcohol consumption in the seven county metro area surrounding the Twin Cities, Minnesota. After using statistical modeling to isolate useful variables, a spatial analysis was conducted on the appropriate variables to predict three negative consequences; motor vehicle crashes (MVCs), motor vehicle fatalities (MVFs) and arrests for driving while intoxicated (DWIs). The intention was to provide a snapshot of risk for the metro counties relative to each other, for example: which counties have the highest predicted rates of drinking and driving? Demographic, economic, geographic and legal information were incorporated into the model with the intent of identifying the factors that contribute to illegal roadway actions and their consequences. Analysis showed that prediction models for MVFs and DWIs contained serious issues and that only the MVC model was appropriate for prediction. Analysis of the MVC model showed that a wide range of variables determined negative consequences and that differences in legislation did not have an effect in determining the extent of alcohol related issues.