

Session #12:

## **INTELLIGENT TRANSPORTATION SYSTEMS EARLY DEPLOYMENT PLANNING FOR A SMALL REGION**

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### **ABSTRACT**

Strategic planning for intelligent transportation systems (ITS) in smaller metropolitan areas presents a number of difficulties. Transportation problems such as high levels of traffic congestion and complex operational challenges in both traffic and transit management often create interest in high tech solutions in large metropolitan areas. Such solutions are typically not viable in the nation's less populated regions, as solutions devised in Atlanta, Houston, Seattle and Phoenix usually do not apply to problems in places like Portland, Maine. Moreover, awareness of and experience with the use of electronics and communications systems among transportation system operators is often more limited in a small metropolitan region like Portland, Maine than in a major metropolitan center. This paper and presentation describes the successful ITS early deployment strategic planning process developed for the Portland region. This process began with assembly of relevant stakeholders, attention to raising stakeholders' awareness of ITS capabilities, costs, and benefits; development of a framework based on regional goals for evaluating ITS applications; preparation and ranking by stakeholders of a program of ITS projects; and completion of a report of findings and recommendations to regional, state, and federal decision-makers.

While not populous, the Portland, Maine region is a promising setting for ITS deployment. Portland is a multimodal environment for both passenger and freight movement. Passengers are served by one local and one international ferry operator, four local and two intercity bus companies, and a busy regional airport. Planning is also underway for the restoration of passenger rail service from Boston to Portland. Freight operations included containerized and bulk shipping services at the port. Rail and truck operations take place both portside and inland. The region is served by the Maine Turnpike, which has recently deployed electronic tolling, the state's first major ITS deployment. In addition, the region has a manageable number of agencies and decision-makers.

## INTELLIGENT TRANSPORTATION SYSTEMS EARLY DEPLOYMENT PLANNING FOR A SMALL REGION [DRAFT]

### Introduction

A few years ago, advanced transportation technologies known as Intelligent Transportation Systems (ITS) were thought to be solely the concern of large metropolitan areas. This is no longer the case. There are many ITS technologies that can be used by small and medium sized communities to improve traffic flow, transit operations, and travel information dissemination. This paper looks at how one medium sized area, the Portland, Maine Metropolitan Area, utilized an Early Deployment Planning (EDP) Program to determine which ITS technologies would be appropriate for their region.

### 1. Early Deployment Planning Program

#### *a) Early Program History*

The Early Deployment Planning Program came about as a result of the passage of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). Section 6055(b) of ISTEA authorized the Federal Highway Administration (FHWA) to “make grants to State and local governments for feasibility and planning studies for development and implementation of intelligent vehicle-highway systems.” This grant program became known as the Early Deployment Planning (EDP) program, and became an important part of the US Department of Transportation’s Intelligent Transportation Systems initiative.

The EDP Program originally focused on the 75 most populous metropolitan areas, and well as 30 major intercity corridors. By March 1996, 66 EDP studies had been completed or were underway.

#### *b) Portland Decides to Apply for Program*

On March 11, 1996, the FHWA published a call for metropolitan areas to apply for Early Deployment Planning grants. The Federal Register notice stated the EDP Program is designed to assist metropolitan areas to develop an ITS strategic deployment plan that would:

- 1) *Identify and document applicable ITS user services,*
- 2) *Establish system performance criteria,*
- 3) *Assess the functions and requirements of the system,*
- 4) *Identify and evaluate potential technologies on the basis of performance, compatibility, flexibility, and cost,*
- 5) *Assess potential funding and implementation options, including use of private sector resources, and*
- 6) *Identify time frames for implementation.*

Applicants for the EDP program were required to submit an application demonstrating that the

officials in the metropolitan area had an understanding of local needs, a commitment to good transportation management, a cooperative relationship between agencies, and a general understanding of the type of ITS user services which will address local needs. At the urging of the Maine Division of the Federal Highway Administration, the Greater Portland Council of Governments decided to apply for an EDP grant.

On May 9, 1996, the Greater Portland Council of Governments (GPCOG) submitted a formal expression of interest in receiving an EDP grant to FHWA. The proposal emphasized the progressive multimodal transportation planning that the Portland area has engaged in over the years and the cooperation among transportation agencies in the area. The proposal was endorsed by the Maine Division and Region 1 of FHWA, and sent to FHWA Headquarters in Washington.

*c) Project Selection and Orientation Session*

On September 24, 1996, the FHWA Associate Administrator for Safety and System Applications, Dennis Judycki, approved the Greater Portland EDP project for Early Deployment funding. Portland was among thirteen metropolitan areas that received EDP grants at that time. As it turned out, the September 1996 EDP grants were the last set of EDP grants, and no further EDP grants are expected to be awarded in the future. The Portland, Maine region, with an urbanized area population of about 120,000 and countywide population of about twice that number, became the smallest region in the nation to have received funding for ITS early deployment planning.

On October 30, 1996, Joe Kott from the Greater Portland Council of Governments and Steve Benningo from the FHWA Maine Division attended an Early Deployment Planning Seminar in Washington, DC. The purpose of seminar was to provide the September 1996 recipients of EDP grants with an overview of the EDP process. The importance of mainstreaming ITS considerations into the transportation planning process was stressed. Participants learned that ITS works best when transportation problems are first identified and then ITS solutions are crafted to the dynamics of the existing problems.

## **2. Early Process**

*a) Formation of the EDP Committee*

GPCOG staff began the ITS early deployment planning process by inviting a broad spectrum of stakeholders to join a Greater Portland ITS Early Deployment Plan Advisory Committee that would provide policy guidance to the effort. In this role, the Advisory Committee would ensure that the Early Deployment Plan met regional needs. In turn, the Committee would add its

credibility to the planning process by formally adopting a recommended Early Deployment Plan, including a generalized program of ITS projects, for the Portland region. The City of Portland's Transportation Director, whose purview included the state's busiest airport and a containerized port terminal operation, served as ITSEDP Advisory Committee Chair. In addition, the Advisory Committee included Portland's Mayor (who was also a member of the local transit district board), both Portland's Parking Manager and its Fire Chief, the Greater Portland Transit District General

Manager, the Casco Bay Island Transit District (a local ferry service) General Manager, the Portland MPO Director, the Town Planner for the nearby retail shopping mecca of Freeport, GPCOG's own Rideshare Program Coordinator, engineering and planning staff from the Maine Turnpike Authority, a staff engineer who was then coordinating Maine DOT's ITS efforts, a transportation energy specialist with the Maine Department of Environmental Protection, officials from both the Federal Highway Administration and the Federal Transit Administration, and a local physicist and engineer who was also a citizen member of the Portland MPO Technical Committee. The Advisory Committee and staff worked together from January 1997 through adoption of a final report of findings and recommendations in January 1998.

*b) Defining the EDP Process*

The EDP planning approach approved by the Advisory Committee was strategic and regional, rather than project-level, in nature. Such an approach took into consideration region-wide transportation goals and the suitability of various ITS technologies to meet those goals. The planning time horizon chosen was ten years, a compromise between taking the "long view" – often defined in transportation planning as twenty years – and the reality that technological change has become so rapid that in twenty years whole new and largely unforeseen technologies are likely to be available. The Committee and staff defined the Greater Portland ITSEDP work program as an investigation of ITS capabilities, benefits and costs; development of a recommended program for ITS development in the region; and promulgation of a report of findings and recommendations to decision-makers at all level of government, as well as to interested citizens. This final report would contain Advisory Committee ITS priorities for the region in rank order, a logical deployment timeframe for the deployments, and identification of appropriate entities to carry out each deployment.

*c) Establishing Goals for a Regional ITS Program*

Early in the EDP process, the Advisory Committee adopted a set of goals for ITS development. These goals would guide the planning process and provide a basis for assessing the potential for ITS deployments in the Portland region. The Committee decided on a limited set of desired and important outcomes of a regional ITS effort. The seven broad goals established for Portland's ITSEDP were as follows:

- *More accessible and complete travel information*
- *A more efficient, cost-effective transportation system*
- *Safer travel*
- *Cleaner air*
- *More energy-efficiency*
- *Economic development*
- *Improved interagency coordination/cooperation*

The Committee also formally endorsed the six national ITS objectives that had been established by the USDOT:

- *Reduced travel time*
- *Increased service reliability*
- *Cost reductions*
- *Safety and security improvement*
- *Ridership and revenue increases*
- *Reduced emissions*

During the evaluation process, the Advisory Committee decided to use these national objectives weighted by the Committee to suit the Portland region's needs, to score prospective ITS deployments. In doing so, the Committee recognized the similarity between the national objectives and the set of regional goals it had established. Most importantly, the Advisory Committee wished to develop an ITS program for the Portland region that would be competitive for any national funding that might be available for operational tests or model deployments. In the Committee's view, aligning the Portland ITS evaluation process with national objectives, appropriately weighted to reflect regional priorities, would help accomplish that end.

#### *d) Committee and Staff Education*

An important task for both the Advisory Committee and staff throughout the year-long Portland EDP process, particularly in the first several months of work, was to learn more about ITS capabilities, benefits, and costs. As described in the first section of this paper, the Portland ITSEDP project manager and an FHWA transportation planner who later participated as a member of the EDP Advisory Committee attended an Early Deployment Planning Seminar at the Federal Highway Administration's offices in Washington before formal initiation of Portland's ITS strategic planning effort. Staff field investigations included participation in an ITS Executive Scan and Tour of Atlanta ITS deployments and a week-long Institute of Transportation Engineers Southwest U.S. ITS Study Tour. Two of the transit managers on the Advisory Committee participated in Federal Transit Administration ITS study tours in Montana and California, respectively. Both staff and Advisory Committee members also joined in a field investigation of Maine Turnpike Authority electronic toll and changeable message sign installations.

Guest presenters also contributed to Committee and staff education. Federal Highway Administration staff presented an "ITS Awareness Seminar" for all participants in the Portland EDP process. This session was also attended by a number of other officials and citizens not directly involved in the ITS planning effort. One Advisory Committee meeting featured a guest presentation by an executive from SmartRoute Systems on the use of ITS in Boston and other metropolitan areas to disseminate traveler information. In addition, a number of national ITS experts and vendors participated in a day-long Maine ITS Symposium and Vendor Exhibition jointly sponsored by the Advisory Committee and the Greater Portland Council of Governments. This event is described in more detail below.

Portland ITSEDP staff also did considerable research in ITS capabilities and deployment results. Results of this work were presented to the Committee verbally and in a series of briefing papers. ITS America and both the Federal Highway and Federal Transit Administration were important resources for this research.

*e) Maine ITS Symposium and Vendor Exhibition*

The Maine ITS Symposium, held in March 1997 at the campus of the University of Southern Maine in Portland, assembled ITS subject matter experts to discuss and display advances in transportation electronics and communications technology. Featured presenters included National Transit Institute Fellow David Hill and Marion Waters, a well-known Georgia Department of Transportation official who played a key role in ITS deployments for the 1996 Olympic Games. Vendor's exhibits comprised ITS applications such as smart cards, electronic toll payment systems, changeable message signs, automated traffic signal programs, and both transit trip itinerary planning and paratransit scheduling programs. Concurrent with the program of individual speakers and panel discussions, David Hill conducted morning and afternoon ITS workshops for transit managers. The Symposium and Vendor Exhibition attracted attendees from throughout Maine and from nearby states.

An ITS Public Focus Group was also held as a companion activity to the Symposium and Vendor Exhibition. The focus group, which included members of the lay public without a professional transportation background, was given a tour of vendor displays and a brief introduction to ITS applications. With this information as background, members of the group discussed the utility of various ITS technologies from the perspective of automobile and transit users. Results of this session were summarized and presented to the Advisory Committee. Since most Advisory Committee members were transportation professionals, this citizen perspective was a useful supplement to the insights provided by Committee members themselves during the EDP process.

*f) Development of Briefing Papers*

The results of staff research, the ITS Symposium and Vendor Exhibition, ITS study tours, and guest presentations to the EDP Advisory Committee were organized and condensed in a series of briefing papers. Portions of these papers were also included in the Portland ITS final report of

findings and recommendations. Briefing paper subjects included traveler information systems, advanced public transit systems, and advanced traffic management systems. Each paper described pertinent technologies and applications experience in the field throughout North America. While these documents were written to be readable and accessible, technical appendices and bibliographies for supplementary reading were included at the end of each briefing paper. The papers were not only distributed to the Portland ITSEDP Advisory Committee, but also to members of the Portland MPO Technical Committee as reference documents.

### 3. Ranking Process

#### *(a) Developing ITS “Projects”*

Based on the research and education initiatives described previously and using a typology recommended by USDOT, Portland ITSEDP staff prepared five preliminary ITS market packages, which were termed “projects”. Each project was comprised of a series of ITS applications, as shown below. The Advisory Committee decided to retain italicized items, including four of the five proposed projects, for further evaluation. Note that transportation safety was eliminated by the Advisory Committee as a separate project. Instead, the Committee endorsed an emphasis on safety in the planning and design of all ITS deployments.

#### □ ***Project 1: Traveler Information***

*electronic bulletin boards/text television*  
*smart kiosks/worldwide web*  
*highway advisory radio*  
*parking advisory radio*  
*weather advisory radio (roadside)*  
*changeable message signs, highway information*  
*changeable message signs, parking information*  
*radio and television*  
toll-free and pay number  
traffic automated telephone system

#### □ ***Project 2: Public Transit***

*computer-aided dispatch* (subsequently grouped with AVI/GIS below)  
*electronic fare payment*  
*automated vehicle identification/geographic positioning/geographic information systems*  
*smart kiosks/worldwide web*  
*on-board vehicle annunciators and electronic bulletin boards*  
*radio/tv*  
*automated passenger counters*  
on-board vehicle diagnostics  
trip itinerary planning  
stop and terminal information systems  
on-board vehicle guidance  
security systems

***Project 3: Traffic Management***

*signal automation and coordination*  
*signal preemption*  
parking management  
emergency management  
incident management  
lane control/variable speed signs  
ramp metering

□ ***Project 4: Electronic Payment***

*smart cards*  
electronic tags

□ ***Project 5: Safety***

pedestrian/bicycle crossing systems  
traffic violation deterrent and enforcement  
smart intersections  
call box/mayday systems  
weather warnings  
wildlife warnings

*(b) Preliminary Project Scoring*

Portland EDP staff developed an evaluation framework that was used, after review and modification by the Advisory Committee, for preliminary project scoring purposes. The evaluation or scoring process combined weighting national ITS objectives to reflect regional needs with a broad, qualitative assessment of the impact of an ITS project or application. The Advisory Committee weighted each of the six national USDOT ITS objectives as follows:

| <b><u>Established National Objective</u></b> | <b><u>Assigned Regional Weight</u></b> |
|--|--|
| ▪ <i>Reduced travel time</i>                 | .15                                    |
| ▪ <i>Increased service reliability</i>       | .10                                    |
|  |  |
| <b><u>Established National Objective</u></b> | <b><u>Assigned Regional Weight</u></b> |
| ▪ <i>Cost reductions</i>                     | .20                                    |
| ▪ <i>Safety and security improvement</i>     | .20                                    |
| ▪ <i>Ridership and revenue increases</i>     | .20                                    |
| ▪ <i>Reduced emissions</i>                   | .15                                    |

It is interesting to note that, while the Portland region is classified as Nonattainment for Ozone

and has congested intersections and links on its roadway system, economic and transportation safety objectives were weighted more heavily by the Advisory Committee than air quality or traffic congestion. Moreover, the Portland region has long emphasized economic development and the shortfall of funding available for transportation systems. More polluted and congested regions would in all probability reflect different priorities.

The scoring scale used in qualitative assessment of ITS impact on each of the above objectives was as follows: no impact (0), marginal impact (1), moderate impact (2), and substantial impact (3). The Advisory Committee charged EDP staff with the task of scoring each ITS project and constituent applications based on a subjective assessment of impacts on the regionally-weighted national objectives. The subjective assessment of staff was to be based, in turn, on research and education in ITS as well as professional judgement and local knowledge. Based in scoring done by EDP staff, Composite "Potential Performance Values", average ratings on the 0 to three scale, were developed for each of the remaining four ITS projects. "Composite Weighted Scores", ranging from 0 to 100%, were also calculated for each remaining application within the projects. These scores reflected the percentage contribution of each application to the overall score of the project. Illustrative results for all projects and applications and for one of the Projects (Traveler Information) and its constituent applications are as follows:

**For all Projects –**

| <b><u>Project</u></b> | <b><u>Potential Performance Rating (average rating)</u></b> |
|-----------------------|---|
| Traffic Management    | 1.80  |
| Electronic Payment    | 1.55  |
| Public Transit        | 1.20  |
| Traveler Information  | 1.125   |

**For all Individual Applications –**

| <b><u>Application</u></b> | <b><u>Potential Performance Rating (average rating)</u></b> |
|---------------------------|---|
| AVI/GPS/GIS               | 2.30  |
| Traffic Signal Preemption | 2.00  |

| <b><u>Application</u></b>                 | <b><u>Potential Performance Rating (average rating)</u></b> |
|---|---|
| Signal Automation/Coordination            | 1.60  |
| Changeable Message Signs (roadway)        | 1.60  |
| Smart Cards                               | 1.55  |
| Highway Advisory Radio                    | 1.55  |
| Smart Kiosks/World-wide Web (Transit)     | 1.30  |
| On-board Annunciators                     | 1.20  |
| EBB/Text TV                               | 1.20  |
| Smart Kiosks/World-wide Web (Travel Info) | 1.15  |

|                                    |      |
|------------------------------------|------|
| Weather Advisory Radio (roadside)  | 1.10 |
| Changeable message signs (parking) | 1.05 |
| EBB/Text TV (Travel Info)          | 0.95 |
| Parking Advisory Radio             | 0.95 |
| Passenger Counters                 | 0.95 |
| Radio/TV (Travel Info)             | 0.60 |
| Radio/TV (Transit)                 | 0.25 |

**For the Entire Traveler Information Project -**

| <b><u>Objective</u></b>          | <b><u>Potential Performance Rating (average rating)</u></b> |
|----------------------------------|---|
| Travel time reduction            | 2.85  |
| Service reliability improvements | 1.90  |
| Cost reduction                   | 0.00  |
| Safety/security improvements     | 2.60  |
| Ridership/revenue increases      | 0.00  |
| Emissions reductions             | 1.65  |

**For Component Applications within the Traveler Information Project –**

| <b><u>Component Application</u></b> | <b><u>Composite Weighted Score (percentage contribution to Project impact)</u></b> |
|-------------------------------------|--|
| Changeable Message Signs – highway  | 18%  |
| Highway Advisory Radio              | 17%  |
| Smart Kiosks/World-wide web         | 13%  |
| Weather Advisory Radio – roadside   | 12%  |
| Changeable Message Signs – parking  | 12%  |
| Electronic Bulletin Boards/Text-TV  | 11%  |
| Parking Advisory Radio              | 11%  |
| Radio/TV                            | 7%   |

*(c) Advisory Committee Ranking of Projects and Applications*

The Portland ITSEDP Advisory Committee reviewed staff scoring of ITS projects and applications and used the results to begin developing a prioritized regional ITS program of projects. The Committee relied on its own judgement and sense of regional needs, opportunities, resources, and realities in developing this ITS program. In doing so, it further condensed the list of projects by merging Fare Payment into Public Transit. As a first step, through discussion and debate, the Advisory Committee developed its own rank order of overarching ITS projects, as follows:

**ITS Project**

**Portland ITS Advisory Committee Ranking**

|   |   |
|---|---|
| Public Transit (including Fare Payment) | 1 |
| Traveler Information                    | 2 |
| Traffic Management                      | 3 |

Further, the Advisory Committee developed its own rankings for applications within each project. Along with the rankings, a deployment initiation timetable and recommended implementing entities were established for the Portland ITS Program of Projects. In order to have a more comprehensive list, in some cases the Advisory Committee included applications that had been previously dismissed. Typically, these were placed in an “unranked” category. By way of illustration, the Public Transit Project was described as follows:

| <b><u>Applications</u></b>                                 | <b><u>Component Rank</u></b> | <b><u>Begin Deployment</u></b> | <b><u>Deployment by</u></b>                          |
|--|------------------------------|--------------------------------|--|
| Automated Vehicle Location/<br>GPS/Computer-aided Dispatch | 1                            | before 2003                    | specific transit<br>operators                        |
| Smart Cards  | 2                            | before 2003                    | specific transit<br>operators                        |
| Smart Kiosks/WWW   | 3                            | before 2003                    | specific transit<br>operators                        |
| EBB/Text TV  | 4                            | between 2003<br>and 2008       | specific urban<br>and intercity transit<br>operators |
| On-Board Annunciators                                      | unranked                     | before 2008 if<br>feasible     | specific transit<br>operators                        |
| <b><u>Applications</u></b>                                 | <b><u>Component Rank</u></b> | <b><u>Begin Deployment</u></b> | <b><u>Deployment by</u></b>                          |
| Passenger Counters   | unranked                     | before 2008 if<br>feasible     | specific transit<br>operators                        |
| Passenger Security Systems                                 | unranked                     | before 2008 if<br>feasible     | specific transit<br>operators                        |
| Transit Systems Management<br>Center                       | unranked                     | before 2008 if<br>feasible     | specific transit<br>operators                        |
| Traffic Signal Preemption                                  | unranked                     | before 2008 if<br>feasible     | specific transit<br>operators                        |

All three overarching Portland ITS projects were similarly defined by the Advisory Committee.

This program was included in the final report of findings and recommendations.

#### **4. Implementation and Next Steps**

A number of presentations were made by GPCOG staff to Portland Area Comprehensive Transportation Study (PACTS, the Metropolitan Planning Organization for the Portland, Maine metropolitan area) committees and to MDOT officials on the outcome of the EDP study and on the study's recommendations.

One recommendation in the EDP report was to encourage Maine DOT to lead in the creation of a Maine ITS America chapter. The formation of a State ITS Chapter would provide a forum for MDOT staff, MPO staff, municipal engineers, transit providers, and interested private sector parties to cooperatively plan for and implement ITS in the State of Maine. It would provide a mechanism for professional and technical support and coordination to ITS project planners throughout the State. The Maine Department of Transportation (MDOT) is receptive to such collaboration and has recently formed an ITS Steering Committee to coordinate its efforts with those of GPCOG, the Maine Turnpike Authority, and others interested in ITS implementation.

The Greater Portland Council of Governments is taking a number of steps on its own to implement the recommendations of the EDP study. GPCOG is currently providing technical assistance to agencies interested in programming ITS projects within PACTS' Transportation Improvement Program. In addition, GPCOG hosted an ITS Stakeholders meeting on September 25, 1998 to discuss ways to implement the ITSEDP priorities in the Portland area.

GPCOG is also involved in the development of an ITS Service Plan for the Portland area. The U.S. Department of Transportation, as a result of the success of the EDP process and the area's multimodal focus, selected Portland, Maine to be the first location in the nation to undertake an ITS Service Plan.

The purpose of an ITS Service Plan is to integrate institutional partnerships and technical resources in a multimodal environment to promote the use of ITS in meeting the transportation needs of a region. The ITS Service Plan outlines services, actions and products to be provided by the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) to a metropolitan or rural area. This plan will help FHWA and FTA to better focus training opportunities and other resources to the needs of the Portland area.

The Greater Portland Transit District, or Metro, the largest transit provider in the region, is in the process of designing and installing electronic ("smart") kiosks on Forest Avenue, a major commuter corridor. This project is part of a wider effort, including more frequent service and improved passenger-waiting areas, to increase transit ridership on the corridor.

## **5. Applicability to Other Small and Medium Sized MPOs**

Planning for ITS deployments is a process that is applicable to all small and medium sized MPOs. The MPOs should look into ways that ITS can help them solve their transportation problems. They should begin by making a list of transportation problems in their local area. Then they should educate themselves on the various ITS technologies, and think about which technologies can help solve local transportation problems. Then an analysis of ITS benefits and costs should be developed, followed by the placement of the most promising projects in the MPO's Long Range Plan and Transportation Improvement Program.

While MPO staff can undertake some of the work listed above, the best forum for ITS planning is a committee of stakeholders. This committee should consist of MPO staff, state department of transportation officials, FHWA and FTA representatives, local transit operators, municipal engineering and planning staff, emergency service providers, parking managers, business representatives, and interested private citizens.

Small and medium sized MPOs should feel free to contact the US Department of Transportation for assistance in developing and implementing ITS projects and programs. The USDOT is looking for areas to undertake an ITS Service Plan. Your FHWA Division Office ITS Specialist or your FTA Regional Office contact person would be happy to provide you with more information about an ITS Service Plan, ITS funding opportunities, and how to integrate ITS into local and regional transportation planning.

### **Acknowledgement and Appreciation:**

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