Further, these networks, which are presently based on cellular technology, can also be adapted to palm-sized telephones and computers. In the future, it can be envisioned that people with small wireless telephones will be able to call for transit information from any location, even walking along the sidewalk. Directions for walking to the closest transit stop may be given or a bus diverted to pick the person up.

Think of the many opportunities to keep people advised of changing travel conditions through the use of this technology. Using a paging system, people could be buzzed when their bus is a few minutes away. We might even buzz them when an incident occurs and when it has cleared.

I have presented a brief vision of how a number of new IVHS technologies can impact our world as transportation management professionals. These new technologies are linked together—and with users—through information systems that permit people to make good decisions based on real-time information.

We are in the information age. The trend toward even greater information interchange is accelerating. As electronic and communication devices become smaller, less expensive, and more reliable, people will avail themselves of the great benefits these devices provide.

Information interchange is becoming easier and quicker. Access to more information that is relevant to people's daily lives will permit them to make better decisions. Our challenge is to design a system that is consistent with developing public policies on clean air and energy.

Yes, there is a paradigm shift underway. As we look to the future, there is indeed a new way of looking at, thinking about, and improving mobility.

Congestion Management Systems: Requirements and Opportunities

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I would like to take a slightly broader perspective and focus my comments on how all the different elements and systems can be coordinated into an overall congestion management system. I want to talk specifically about the congestion management system required in the ISTEA. When the Symposium Planning Committee met for the last time this past January, we thought the symposium would provide a great opportunity to discuss the requirements, issues, and opportunities of the congestion management system contained in the ISTEA. Unfortunately, the regulatory process has not been completed and the requirements have not been issued yet.

Although there are no requirements at this point, there are a number of issues and opportunities that can be discussed. I think the fact that we have a policy legislated by Congress on an issue most transportation professionals felt needed to be addressed presents us with the

opportunity to shape the congestion management systems to meet the needs of individual areas.

FHWA is currently in the middle of a 60-day open comment period and I want to stress that we are interested in your input. This is the first of three comment periods in the regulatory process. I want to briefly highlight the key elements of the legislation with regards to congestion management systems, identify some of the major system characteristics, and discuss the key issues and next steps in the process.

If you have read the legislation, you should be well aware of the strong emphasis on congestion, mobility, and management of the transportation system. Specifically, Section 1034 requires that each state develop six management systems. The six areas to be addressed by these systems are: pavement, bridges, highway safety, traffic congestion, public transportation facilities and equipment, and intermodal transportation facilities and systems. A seventh area, addressing traffic monitoring systems, is also required to provide input data to these six areas. The overall goal of all these systems is to develop an integrated traffic information system to assist in the decision-making process relating to transportation system investments.

The legislation requires that the congestion management system be developed in consultation with the MPOs in urban areas. This further indicates the new importance being placed on MPOs under ISTEA. The legislation also includes a well-defined link to both the metropolitan and the statewide planning process. This builds on the existing process and provides consistency with the current planning process. There is also a very strong link to air quality. The legislation establishes Transportation Management Areas (TMAs) in metropolitan areas with populations over 200,000. No single-occupancy vehicle capacity can be added in these areas with federal funds unless the project is part of a congestion management plan. This is a significant incentive to develop a good congestion management plan.

The legislation requires that the guidelines and requirements for all six management areas be completed by December 18, 1992. It also requires that states certify by January 1, 1995 that they are in the process of implementing all six management systems and the traffic monitoring system. Thus, the first issue to be addressed is what must be completed by this deadline and what will be required in the certification process.

The legislation also provides for funding to support the different activities required by the law. A number of funding sources can be used to support the different management systems. These include the National Highway System, the Surface Transportation Program, Highway Planning and Research, Congestion Mitigation and Air Quality, transit capital programs, and others.

The overall purpose of all the management systems is to provide information for decision-makers to effectively and efficiently manage the surface transportation systems. Thus, it is important to realize that the management systems are not an end product. The purpose of these systems is not to just collect data and generate reports, but to actually help solve congestion problems. The congestion management systems should provide a tool to do this.

I would like to briefly describe some of the issues I see that need to be addressed with the development of congestion management systems. The first one deals with areawide coverage. I think one of the big flaws in many areas with existing congestion management programs, including California, is that plans are prepared on a county basis. For example, each of the nine counties in the San Francisco Bay Area has a plan, and they are not necessarily coordinated. I think that congestion management has to be approached from an areawide perspective.

Second, I think congestion management systems need to be multi-modal. By this, I mean not only the surface or highway modes, but also light, heavy, and commuter rail systems. Rail can play a big part in determining the level of

congestion in a corridor. Third, there also needs to be a link to land use. We know the importance of the link between land use and congestion levels and we need to do a better job of coordinating the land use and the transportation decision-making process. I am not sure exactly how this can be accomplished, but it is important that it be addressed. The link to air quality is also important.

The congestion management systems need to address both recurring and non-recurring congestion. Historically, I think we have done a relatively good job of monitoring recurring congestion, but a relatively poor job of monitoring and addressing non-recurring congestion. There also needs to be an implementation focus to these systems, rather than just a data reporting function.

A number of elements are critical to the success of congestion management systems. A data base that includes the roadway and traffic characteristics must be established. Performance measures must be developed and used to determine how the system is functioning. Standards are also needed to identify the desired performance levels. An assessment of baseline conditions is important to establish the current location, severity, and duration of congestion.

A forecasting element is also needed to identify future needs and changes. This should tie into the traffic forecasting process and link with land use planning activities. A needs assessment should also be conducted. In the past, we have not always done a good job of this. This assessment should include an examination of latent demand and both short- and long-term needs. A broad range of potential solutions should be examined. These may include adding new capacity, transit, traffic management programs, IVHS, TDM, and other appropriate strategies. Project and strategy selection should not be limited to a narrow list of alternatives, but should include a broad range of projects. There is no one answer or solution. Finally, a monitoring system needs to be incorporated into the program to provide for ongoing evaluations.

A number of key issues are being examined during the regulatory process. One of these is determining which agencies and groups need to be involved. The legislation gives the states the primary responsibility for implementing congestion management systems. However, it is obvious that MPOs, transit agencies, air quality management agencies, and others must be involved. Another important issue is system coverage. We know that TMAs, or metropolitan areas over 200,000 in population, will be covered as required in the legislation. After these areas, however, it is less clear what areas should be covered and what roadway systems should be included.

Data availability is another concern that has been voiced in many areas. Everyone is concerned that a great deal more data collection will be required. The exact nature of the data requirements have not been determined yet. Performance measures and performance standards are also getting a good deal of attention. The questions here revolve around what measures and standards you should select and how they should be applied.

A relationship also needs to be established with the other management systems. These include the intermodal, transit, and safety management systems. Determining how these links will occur will be important. There is also an issue related to carrots *vs.* sticks, or the use of incentives *vs.* disincentives. The ISTEA focuses more on disincentives. I think it is also important that we build some incentives into the process.

Finally, I would like to point out the next steps in the process. The Notice of Proposed Rule Making has been issued and the 60-day comment period is open until August 3, 1992. I would encourage individuals to provide comments on the proposed rule. A series of public workshops are also being conducted to discuss all of the management systems. There will be two more comment periods before the final regulations are issued.

To summarize, I think there is a tremendous potential to tie all the concepts that have been discussed during the symposium together into a coordinated management system that will help address urban congestion problems. The involvement and input from sources is important in developing the regulations for the congestion management systems, and FHWA is interested in your comments. Thank you.

ITMS to IVHS

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JHK & Associates

I would like to focus my comments on the current status of ITMS activities and how we move from ITMS to IVHS. Thus, unlike many speakers at the symposium, I will be addressing IVHS. I would also like to discuss the different approaches that can be used in the development of IVHS and the advantages and disadvantages of these.

Although it may seem obvious, one of the available options is to do nothing to plan the systematic development of ITMS and IVHS. A number of systems have been implemented and other activities are currently underway. Thus, one approach would be to just let these activities occur without any type of coordinated plan. I would suggest, however, that this is not the most appropriate approach. Rather, I would support a more systematic plan that focuses on the key direction and goals we wish to accomplish.

Where are we today? I think the current state-of-the-art is fairly high. There is a good understanding of the elements and capabilities of ITMS and IVHS. However, I would suggest that the state-of-the-practice is not as high. The number of areas and jurisdictions that are using the currently available tools is relatively small. The many examples that have been provided at the symposium represent only a small number of areas. It is important that we move quickly toward state-of-the-art systems in other areas. I would also suggest that most of the current systems are jurisdiction-based advanced traffic management systems. Taking a regionwide approach is needed to fully realize the benefits of ITMS.

Although there are many activities underway that focus on IVHS, it appears that many of these could be characterized as somewhat unorganized and frantic. Many areas are trying to obtain funding for IVHS projects without a well thought out and comprehensive approach. The *IVHS America Strategic Plan* and the activities of FHWA and FTA are helping to bring a little more focus and rationale to this process.

At least three different approaches for moving toward ITMS and IVHS have been suggested. First, some people have suggested that we can just jump from where we are currently to ITMS. I think this may be an unrealistic model. The second approach focuses on taking logical, small steps to develop ITMS. This is an approach that has been used successfully with other programs and provides a realistic technique. However, this approach does take a long time and requires numerous steps. I would like to suggest that the third approach, which focuses on taking small steps, but also taking larger leaps in response to specific opportunities, represents the best alternative. I think opportunities do exist to take larger steps and we need to be in a position to take advantage of these.

I think the first step in the process is to continue to implement regionally-based advanced traffic management systems. These systems can demonstrate the benefits of traffic management systems and provide a basis from which more advanced systems can be developed. From these we can move directly into more cooperative efforts and develop the ties to ATIS and APTS. This will help create the giant step attitude.

A number of models have also been suggested for the ultimate approach to IVHS. One model focuses on networking the five IVHS components: ATMS, ATIS, AVCS, APTS, and CVO. This is the approach being taken in many areas. I would suggest that this is a temporary model, however. The model we should ultimately be looking toward focuses on functions that