Final Draft

April 1995

Task 1 - Technical Memorandum

- Define Problems and Systems
- Establish Institutional Framework
- Expand and Strengthen Coalition

ITS Strategic Plan

The Early Deployment of Intelligent Transportation Systems (ITS) In Maricopa County

Maricopa County Department of Transportation

Kimley-Horn and Associates, Inc. Lee Engineering, Inc. Catalina Engineering, Inc. Rockwell International Corporation

Steering Committee Agencies

AAA Glendale UPS Phoenix MAG **RPTA** ADOT Maricopa County Scottsdale ASU Chandler Sky Harbor Mesa SRPM Indian Comm. lotorola DPS Transportation Eederal Express $L \Lambda \Lambda / \Lambda$



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SECTION I - PROJECT OVERVIEW

Intelligent Transportation Systems (ITS) (formerly Intelligent Vehicle Highway Systems [IVHS]), is the application of advanced information processing, communications, vehicle sensing, and central technologies to surface transportation. The objective of ITS is to promote more efficient use of the existing highway and transportation network, increase safety and mobility, and decrease the environmental costs of travel (IVHS Primer, July 1993).

The Maricopa County ITS Strategic Plan is an effort undertaken by the Maricopa County Department of Transportation and a coalition of private and public agencies, to develop a plan for deploying ITS technologies. The vision for this project is to identify innovative ITS technologies for deployment in Maricopa County to satisfy regional transportation needs.

In December of 1991, the Intermodal Surface Transportation Efficiency Act (ISTEA) was adopted by Congress. ISTEA authorizes the use of federal funds for various transportation improvement projects over a six year period (1992-1997).

ITS projects represent a share of these total federal aid program funds. The Federal Highway Administration (FHWA) has developed a Planning Process (Figure 1) to aid local/regional agencies in the development of ITS Strategic Plans. In addition, a National Program Plan for ITS has been prepared to provide an overall framework to guide ITS investment decisions and promote ITS goals.

Maricopa County has outlined a process that closely parallels the National ITS Program Plan and FHWA Planning Process. It has been carefully subdivided into the following eight sequential tasks:

- Task 1:Examine the existing coalition/institutional framework for expansion and
modification. Develop a vision statement and a mission statement with the coalition.
Identify regional transportation needs and deficiencies with respect to safety and
mobility.
- Task 2: Establish short-, medium- and long-range time frames. Based on the varying perspectives of the coalition members, list the short-, medium- and long-range needs of the present transportation system. Match local transportation needs with the associated ITS user services and develop the specific objectives necessary to achieve the user service goals.

ITS Planning Process



- Task 3:Develop a user service plan based upon the needs, goals, and objectives identified in
Tasks 1 and 2. Identify and prioritize user services for short-, medium-, and long-
range implementation.
- Task 4: Establish performance criteria and system measures that can be utilized as a standard to determine how successfully the plan will meet the user service needs, goals, and objectives.
- Task 5:Identify which combination of the FHWA's seven basic functional areas would best
support the local user services. These seven functional areas include:
 - Surveillance
 - Traveler interface
 - · Navigational guidance
 - In-vehicle sensors
 - · Communications
 - Control strategies
 - Data processing
- Task 6:Based upon the functional requirements of the system, define the best system
architecture.
- Task 7: Identify and evaluate alternative technologies on the basis of performance, reliability, costs, benefits, maintenance and operation requirements, and environmental impacts.
- Task 8: Develop a region-wide Strategic Plan that meets the needs, goals, objectives, and standards established in earlier tasks. The plan will include a set of projects for short-, medium-, and long-range implementation.

As a basic set of guidelines for these eight tasks, the project scope of work includes the following six goals:

- · Identify and document applicable ITS user services
- Establish system performance criteria
- Assess the functions and requirements of the system
- · Identify and evaluate potential technologies on the basis of performance, compatibility flexibility, and cost
- Assess potential funding and implementation options
- · Identify time frames for implementation.

SECTION II - TASK 1 OVERVIEW

The primary focus of Task 1 has been to identify the problems, needs, and deficiencies of the present transportation system in Maricopa County. In order to identify these needs, a coalition of ten focus groups and one Steering Committee was formed. This coalition was established in order to expand, strengthen, and solidify the membership of a previously formed coalition. This previous coalition was formed through the efforts of the MAGIC study in 1993 undertaken by Maricopa County.

The Steering Committee is comprised of 24 representatives from both the public and private sectors. Public sector representatives were chosen from state, county, and local agencies while the private sector representatives where chosen from among the transportation, education, delivery, and high tech industries in Maricopa County. Steering Committee members presently meet on a monthly basis to coordinate the on-going progress and development of the Maricopa County ITS Strategic Plan.

The focus groups were formed to assist the Steering Committee in gathering valuable input and perspective from the transportation system users throughout Maricopa County. Each focus group targeted a specific category of similar and/or related transportation users. These groups included:

- · Public agencies
- Emergency response and rescue teams
- Air travel and airport related services
- School systems $(\tilde{K}$ 12)
- · Trucking
- · Bussing
- · Rail services
- Utility companies
- · Resorts
- · Shopping centers
- · Chambers of commerce
- Colleges and universities
- · Major employers
- · Special events

An additional purpose of these focus groups was to promote greater public awareness, education, and involvement in ITS.

The Task 1 Process is outlined in the flow chart shown in Figure 2.

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Figure 2 Maricopa County ITS Strategic Plan Early Deployment

Project Start



Problems/Needs Definition

To solicit input from a broad range of transportation users, four regional public meetings were scheduled across the Valley. The first regional meeting was held at Glendale Community College. Due to low attendance, the other three meetings were cancelled with the concurrence of the Steering Committee. After reviewing several alternative sources for public input with the Steering Committee, and in consideration of the project schedule, input from several local transportation advisory groups was solicited, including the Cities of Scottsdale, Phoenix, Glendale, Tempe, and American Truckers Association.

SECTION III - REVIEW OF EXISTING INFORMATION

Purpose

In order to take full advantage of previous efforts involving potential and actual deficiencies in the street network, a review of existing studies, projects, and information was conducted. A brief overview of some of these previous efforts are presented in this section. Among some of the projects summarized are the ADOT Freeway Management System and the Phoenix Transit Bus Card Program. Studies include the MAG Travel Speed and Delay Study and the Regional Traffic Counting Program Study. Information was also collected on accidents, population projections, and transit facilities. The purpose behind reviewing these previous efforts was to extract a list of previously identified transportation-related user needs. A summary of these findings is located in Section V.

ITS-Related Projects

Freeway Management System - The installation of the first phase (29 miles) of the ADOT Freeway Management System (FMS) has been under construction since March 1993, with an anticipated completion date of August 1995. The FMS will incorporate several ITS technologies to regulate traffic flow, provide traveler information, and improve incident response time along two major freeway corridors.

This state-of-the-practice advanced traffic management system will ultimately serve more than 200 miles of freeway in the Phoenix area. Key surveillance and control system components include:

- · Incident detectors
- · CCTV
- · Ramp metering
- · Variable message signs
- Interchange traffic signals

In addition, this system also will include the monitoring and control of drainage pump stations, ventilation, security, lighting, and fire suppression subsystems in an underground "deck" section.

There will be a significant emphasis on the management of traffic in the freeway corridors, including the frontage roads and parallel arterial streets. This effort will involve interfacing the computer controlling the freeway system with existing computerized traffic signal systems in several adjacent municipalities. ADOT currently meets with the major cities in the area to coordinate signal timing across jurisdictional boundaries.

The FMS will be controlled from the Traffic Operations Center (TOC) located at 23rd Avenue and Durango Street. **Figure** 3 shows the areas of freeway that have ramp metering installed and locations of variable message signs. When completed, Phoenix's FMS will be one of the most advanced and interactive traffic management systems developed to date.

Phoenix Transit - Phoenix Transit has two projects using ITS technologies. The Bus Card Plus Program consists of a special debit card that is issued by employers. Through the use of this card, the system tracks all boardings and bills the appropriate account. This program is not currently available to the general public, but with its initial success it is seen as a first step toward advancing the use of smart cards for all transit passengers.

Phoenix Transit is also deploying Advanced Vehicle Location (AVL) technology. The goal of this demonstration project was to equip buses with Global Positioning System (GPS) receivers and special computers to allow Phoenix Transit to locate their vehicles at all times and to use voice messages to automatically announce major street crossings and bus stops to passengers. The technology has already been successfully demonstrated in a test vehicle.

Studies 199

Travel Speeds and Travel Time Study - As part of the *Travel Speed and Delay in the MAG Region Study*, data were collected on travel speeds and travel times on many of the major roadways in the Phoenix area. The data were collected using GPS receivers mounted on the roofs of survey vehicles. The GPS receivers collected real-time information on the location and speed of the vehicle. **Figure** 4 shows travel time contours for the outbound PM peak period for the City of Phoenix. The city center location is described as the intersection of Central Avenue and Van Buren Street. The innermost line indicates a ten minute travel time from the city center to the line. The middle and outermost lines represent a twenty and thirty minute travel time, respectively.









PM peak travel speeds are depicted in **Figure 5**. The travel speed shown is the average travel speed of both directions. For example if the eastbound travel speed on a link is 32 mph and the westbound travel speed on that same link is 18 mph, the resultant travel speed would be 25 mph and shown on the graph as a dashed line.

Travel speeds were summarized by community and facility type. The City of Tempe had the slowest arterial speeds for the morning and evening peak hours (approximately 25 mph). Sun City had the slowest speeds during the mid-day period. The Phoenix downtown business district had the lowest average travel speed for arterials (between 25 mph and 30 mph). Tempe also had the slowest freeway speeds during the three time periods analyzed.

Information collected from the travel speeds and travel time studies will assist in prioritizing the geographical locations in Maricopa County for the deployment of ITS projects aimed at improving overall vehicular travel time.

MAGIC - In 1993, the Metropolitan Area Governments Information Center (MAGIC) coalition was formed in response to the growing need for a regional approach to traffic management within Maricopa County. MAGIC is a partnership of government agencies comprised of nine municipalities within Maricopa County, the Arizona Department of Transportation, the Regional Public Transportation Authority, and Maricopa County. The objective of this partnership was to improve regional mobility through enhanced multi-jurisdictional coordination and cooperation. The first step toward the realization of this objective was the Advanced Traffic Management System Feasibility Study which was completed in July of 1994.

This study was divided into three phases, each addressing the feasibility of implementing advanced traffic management systems and concepts from a multijurisdicitional perspective. The three phases included:

- Phase 1: Regional Coordination of Traffic Signal Systems
- Phase 2: Integration of the Regional Signal System with the ADOT Freeway Management System
- Phase 3 : Development of a Regional Advanced Traveler Information System

The findings of each MAGIC phase are summarized below.

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Average PM Travel Speed (1993 Travel Speeds)























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Phase 1: Regional Coordination of Traffic Signal Systems

- The consensus of the MAGIC coalition partners is that a cooperative and coordinated effort of traffic management is needed to address the requirements of federal and local legislation (ISTEA, The Clean Air Act, Arizona Air Quality Plan) and will improve the likelihood of securing funding for traffic signal system improvement projects.
- While all the partners within the MAGIC coalition favor increased planning, coordination, and information sharing on a multi-jurisdictional basis, most local agencies are unwilling to give up control of traffic operations to another local agency or to a regional agency.
- A number of opportunities to improve regional traffic signal coordination were identified. Ten regional arterials, on which improvements to existing traffic signal systems and coordination will enhance regional mobility, were defined.
- Three demonstration projects were defined. These projects include (1) the implementation of multi-jurisdictional signal coordination and traffic operation on ten regional arterials, (2) a test of wireless communications for signal control, and (3) the real-time correlation of traffic signal operations with air quality.

Phase 2: Internation of the Regional Signal System with the ADOT Freeway Management System

- The MAGIC partners agreed that a greater level of communication and coordination between the FMS and local agencies will benefit mobility and reduce the impacts of recurring and non-recurring congestion.
- The feasibility of integrating local traffic control systems and ADOT's FMS was found to be particularly encouraging due to the flexibility of ADOT's FMS design.
- Timing and diversion strategies at interchange signals which will mitigate recurring and non-recurring congestion were defined.
- Three demonstration projects were defined, including (1) implementing region-wide signal synchronization via WWV, (2) implementing fiber optic links between the FMS TOC and local traffic management agencies using the FMS fiber optic trunk as a communications backbone, and (3) integration of arterial and freeway management systems within a freeway corridor.

Phase 3: Development of a Regional Advanced Traveler Information System

- The MAGIC partners agreed that an advanced traveler information system (ATIS) will be an important element in regional traffic management. It is felt that traveler information should focus on notification of incidents, including special events, roadway construction/maintenance activities, and accidents.
- Existing and planned traffic management systems in Maricopa County provide the capabilities to satisfy certain functional requirements of a regional ATIS.
- A regional ATIS will best be accommodated by a distributed architecture which combines existing and planned monitoring, data processing, and information capabilities of the ADOT FMS with the control capabilities of local traffic management centers.
- Three demonstration projects were defined, including (1) the use of probe vehicles equipped with cellular phones to monitor freeway and arterial traffic conditions, (2) implementation of an arterial/special event ATIS, and (3) development of a real-time congestion map.

The findings and results from this study are pertinent towards the development of an ITS strategic plan for Maricopa County. This study can generally be considered as a preliminary strategic plan which will be expanded as part of this project to incorporate other ITS functional areas, including Advanced Public Transportation Systems (APTS) and Commercial Vehicle Operations (CVO). The MAGIC study took the initial steps in identifying opportunities for interagency cooperation in defining the system architecture and functional requirements, developing a strategic deployment plan, and identifying projects needed to ensure successful implementation of ITS technologies in Maricopa County.

Congestion Management Systems Alternatives - This study was completed in 1993 to evaluate various programs and their effect on regional congestion. The need for these programs is due to the 1991 ISTEA legislation. ISTEA prohibits federal funding for transportation projects that provide a significant increase of single-occupancy vehicles in areas that are designated as "non-attainment" areas for carbon monoxide and/or ozone. The exception to this rule is if the project results from an approved congestion management system (CMS) plan.

Most of the recommended programs in the Phoenix study can be implemented by major employers or the public sector. Among some of the more promising programs identified in the study:

- · Signal system-related improvements
- · Employer-based transportation demand management (TDM) programs
- Public sector TDM programs

- · Land use controls
- · Market incentives
- · Road improvements (including high-occupancy vehicle [HOV] lanes and reversible lanes)
- · Transit improvements
- Other modal options (namely pedestrian, bicycle, and telecommuting)

Highway Performance Monitoring System - As a result of the ISTEA legislation, the FHWA has developed the Highway Performance Monitoring System (HPMS) database system as a means of keeping inventory of the nation's roadways to assess the potential impacts of proposed transportation programs and policies. The burden of HPMS compliance has fallen on the state highway agencies with cooperation from local jurisdictions. MAG is responsible for reporting HPMS data to ADOT for roadways within Maricopa County and a portion of Pinal County. MAC's HPMS makes use of a geographic information system (GIS) to maintain and update the required data.

The HPMS stores many traffic and roadway related variables, including:

- · Traffic volumes
- · Number of lanes
- · Access control
- · Pavement condition
- · Median type
- Type of facility and
- · Ownership

Figure 6 depicts the 1994 average daily traffic on all functionally classified roads for the metro area.

As part of the HPMS, the Maricopa County Traffic Count Program was established to provide more accurate traffic volume information. A study evaluated the current traffic counting practices in Maricopa County. Discussions were held with many departments within the County, MAG, ADOT and most major cities, and this study determined that most cities have underfunded traffic counting programs.

The need for storing and maintaining the most current traffic and roadway information is important in developing new projects and new legislation. By maintaining all of this information in a computerized system, changes in policy and direction can easily be tested to see their effect on a region-wide basis.





Other Pertinent Data

Accident Data - ADOT maintains statewide accident data in the Accident Location Information Surveillance System (ALISS) database. Accidents are described as either intersection or non-intersection related. Three years of intersection accident data were obtained from ADOT. Figure 7 shows the three-year summation of accidents at intersections. Only the highest 100 locations are shown on the figure.

This data collected on accident location and frequency will assist in prioritizing the geographical locations in Maricopa County for the deployment of ITS technologies to improve incident management and collision avoidance.

Population and Employment Projections - The Maricopa Association of Governments performs traffic projections for the Phoenix metropolitan area. These projections come from a model that is. in part, based on a number of socio-economic data including employment levels and population figures. Forecasts were generated for every five years starting with 1995. Figures 8 and 9 show the employment and population densities for the forecast year 2015. These densities were calculated by summing the appropriate densities for each traffic analysis zone (TAZ) and dividing by the area of the TAZ.

These density values reveal where the highest levels of employment and housing are anticipated to occur during the next 30 years. By studying these figures, it can be determined where there will be the greatest need for improved transportation facilities.

Transit Data - Phoenix Transit maintains data on park-and-ride lot utilization and bus load factors. Ridership *data* is summarized in the *Phoenix Metropolitan Area Quarterly Transit Ridership Report*. This report includes information on both regular and express routes. Park-and-ride lot data is summarized annually at the end of June. This data includes both auto and bicycle occupancy rates. **Figure 10** shows the park-and-ride lot utilizations and capacities as well as the express bus routes and transit center locations.

Public transit ITS initiatives will most likely be targeted for the high-volume routes identified by this data, as well as transit centers such as park-and-ride lots.

Tucson ITS Initiatives

Tucson Advanced Transportation Technologies Plan - An effort to develop a strategic plan for the implementation of ITS technologies in metropolitan Pima County has just gotten underway. Pima County's ITS Early Deployment Study, the Tucson Advanced Transportation Technologies Plan (TATTIP), began in early 1995 and is scheduled for completion in April





Intersection Accident Locations (1991 - 1993)





Legend



Kimley-Horn and Associates, Inc. Numbers in Circles = Number of Accidents



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1996. This plan will address many of the same issues which are being covered in the Maricopa County study.

The first phase will be to develop a communications infrastructure to support ITS functions. This phase w-ill be developed through the duration of this multi-phased project and is currently underway.

A separate project is about to start that will identify user services and community transportation needs. In addition, advanced transportation technologies will be identified and matched to mitigate these needs.

Similar to the Maricopa County EDP Coalition, the TATTIP will be directed by a Study Administrative Committee (SAC) composed of representatives from PAG, City of Tucson, Pima County, University of Arizona, FHWA, and ADOT. The SAC will appoint a Community Advisory Committee consisting of 20 to 30 representatives from the general public, utility, freight, public safety, and transit operators.

Transportation Technology Laboratory - In an effort to accelerate the development and implementation of ITS technologies, a partnership comprised of the City of Tucson, University of Arizona, and Hughes is creating a real-world environment (i.e. the Living Laboratory) for the testing of advanced transportation technologies and concepts. The living lab will initially be implemented on a 1/2 mile section of Speedway Boulevard in Tucson and will include:

- · Fiber optic communications
- · Video surveillance cameras
- · Video-based license plate readers for use in obtaining travel time data
- · Video-based vehicle detection system (Autoscope)
- · Infrared vehicle emissions monitoring system
- · Control center located at the University of Arizona

The laboratory will be used to evaluate the functionality and effectiveness of newly emerging technologies and traffic control strategies. The laboratory will be expanded in subsequent phases to allow for better evaluation of transportation technologies on arterials and networks. As planned, the living laboratory will provide a test bed which will serve transportation agencies throughout Pima County and Arizona.

Rhodes-Integrated Traffic Management System (ITMS) - The University of Arizona Department of systems and Industrial Engineering is developing algorithms to coordinate the control of signals on freeway/surface interchanges and ramp meters. These algorithms will be demonstrated and evaluated using a computer simulation of conditions along the I-17 corridor. Funding for this ITMS is provided jointly by MAG and ADOT.

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City of Scottsdale ITS Initiatives

The City of Scottsdale has recently upgraded and expanded the citywide signal system. In addition, the City had previously applied for a federal grant for the deployment of various ITS initiatives.

Although these proposed ITS initiatives currently remain unfunded, the City has embarked upon a Traffic Management Program study aimed at the potential implementation of several ITS technologies. The study elements, in part, relate to the upgrade of the signal system and include:

- <u>Communication Analysis</u> Various alternatives to the current leased telephone facilities will be evaluated. Both an economic and technical analysis will be made for alternative communication media including data, voice, and video transmission.
- <u>Traffic Flow Enhancement</u> Vehicle detection and CCTV will be evaluated for future implementation. Needs and uses for detection data inputs into the Traffic Management System (TMS) will be evaluated. Alternative vehicle detection technologies and CCTV will be considered for integration with the TMS.
- <u>Motorist Information Subsystem</u> A variety of motorist information subsystems will be evaluated. Pre-trip alternatives will examine the feasibility of installing kiosks at selected activity centers and utilizing Cable TV to transmit directly to City residents. Additional ATIS considerations include VMS and Travel Advisory Radio applications.
- <u>System Software Revisions</u> Software revisions for the existing TMS will be evaluated to include enhancements to support the existing Series 2000 signal system.
- <u>Traffic Control Center Planning</u> A City Traffic Control Center is being planned. The center will include control equipment and offices in a new or renovated building.
- <u>Regional Traffic Operations Center Interface</u> An analysis of hardware and software upgrades will be evaluated in order to provide two-way communication between the ADOT FMS TOC and City TMS.

City of Glendale ITS Initiatives

A feasibility study was completed in 1993 for the upgrade and expansion of the City's signal system. This study recommended a distributed ATMS incorporating traffic surveillance, advanced traffic control measures, and management of potential flooded roadway crossings in rural areas. A detailed city-wide communication study was also conducted to evaluate alternative communication technologies and accommodate future deployment of ATIS and public transit ITS initiatives. This

ATIS is currently under design and will include CCTV surveillance and traffic responsive capabilities based upon the deployment of system loop detectors.

Equipment capability with adjacent jurisdiction is an important consideration for the City. Joint procurement opportunities with the City of Phoenix are being considered.

Multijurisdictional cooperation with ADOT FMS is also a system goal.

Citv of Phoenix ITS Initiatives

In 1992, the City of Phoenix completed a feasibility study for replacement of the city-wide computerized traffic signal system. Design for the new system began in 1994. The new system is expected to go out for competitive procurement in 1995 with system conversion taking place over the following 3 years.

The new system provides the framework for ITS in Phoenix in the following manner:

- <u>Modular and Non-Proprietary</u> The new system will emphasize the use of off-the-shelf hardware with a minimum of special purpose, proprietary hardware and software. This will include multiple traffic signal controller bands operating in a distributed intelligence manner without the need for local interface units.
- <u>Protocol</u> The Phoenix system will be one of the first systems to implement the National Traffic Control ITS Protocol (NTCIP). This will facilitate future coordination and data sharing with other cities' traffic management systems and ADOT's FMS.
- <u>Fiber Optics</u> The communications media used in the downtown are will be fiber optics which will provide the bandwidth required for many future ITS applications.
- <u>CCTV</u> The new system will provide video surveillance capabilities. Initially, only a few cameras will be installed in the downtown area as a test of their use in traffic surveillance and management. Monitors will be installed in the Traffic Management Center with the provision for additional monitors being added as needed.
- <u>Communications Evaluation</u> Preliminary evaluation of various communication media has been conducted. Although the initial system will continue to use leased telephone lines (except the fiber optics to be installed downtown), the City will continue to evaluate other options such as wireless and cooperative public-private projects with fiber optics providers.

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City of Tempe ITS Initiatives

The City of Tempe notices a high volume of special-event traffic year round, with the majority of this event-generated pedestrian and vehicular traffic is concentrated directly at or in the vicinity of Arizona State University. Major professional and collegiate sporting events, art festivals, concerts, holiday block parties, in addition to daily high-volume commuter traffic to and from the university, have placed a severe strain on the City's transportation network. Although the City has devised several traffic control plans and strategies to mitigate the effects of this high-volume event traffic, additional support is required to effectively handle the congestion, parking, and delay problems associated with this concentrated traffic.

In 1994, the City requested funding for a special event control system that will enable the City to better manage the pedestrian and vehicular traffic generated by large events. Several considerations for this special event ATIS include:

- VMS to alert motorists of barricaded and alternative arterials, as well as alternate parking options;
- Surveillance capabilities to allow City staff a broader perspective of event traffic; and
- Interface with ADOT's FMS.

To date, this proposed ATIS remains unfunded. City staff requested funding early in 1994 with the hope that the system would be functional for the 1996 Super Bowl to be held at Sun Devil Stadium.

SECTION IV - EXPANDING THE COALITION

A significant goal for the success of the Maricopa County Early Deployment Strategic Plan was to build upon the coalition established by MAGIC. This original coalition consisted of representatives from Maricopa County, ADOT, RPTA, and several area municipalities. For the Early Deployment Plan to ultimately reflect regional transportation goals, it was necessary to expand the MAGIC coalition in order to build partnerships among municipal, private industry, and urban/rural users.

Kimley-Horn, in conjunction with Maricopa County, identified over 200 individuals from key public and private agencies whose participation in this coalition would reflect a wide range of transportation user needs. Key stakeholders were identified from this group as potential members for the Steering Committee. This Steering Committee, once formed, provided valuable input for specific focus group participants that would provide an even broader range of area transportation needs. A newsletter explaining ITS and the EDP project objectives was sent to each Steering Committee and potential focus group member identified.

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Each organization or individual which provided a need, goal, or transportation objective is considered an EDP Coalition member. The resulting coalition therefore includes:

- . <u>Steering Committee</u> an expanded consortium from the MAGIC project
- <u>Focus Group Participants</u> an ad hoc group of over 200 individuals representing significant public and private transportation users
- <u>City Transportation Committees</u> appointed individuals in larger municipalities which formulate transportation policies.

Even with this diverse representation, it was determined that rural transportation goals may not be adequately represented. As a result, a number of individuals representing rural communities and individuals with experience in rural transportation applications were contacted to solicit these needs.

Steering Committee

A 24-member Steering Committee representing federal, state, county, municipal, academic, and private agencies was formed to guide the EDP. This Committee meets monthly with the project consultants to provide input and direction for the development of this area-wide Plan. **Table 1** illustrates the Maricopa County EDP Steering Committee and the expansion of the MAGIC coalition to include more representatives from municipal, academic, and private industry.

<u>Agency</u>	MAGIC Coalition	Maricopa County EDP Steering: Committee
Maricopa County	Х	Х
AAA		Х
ADOT	Х	Х
ASU		Х
City of Chandler	Х	Х
DPS		Х
Federal Express		Х
FHWA		Х

TABLE 1. EXPANDED COALITION

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Agency	MAGIC Coalition	Maricopa County EDP Steering Committee						
Town of Gilbert	Х							
City of Glendale	Х	Х						
MAG		Х						
City of Mesa	Х	Х						
Motorola		X						
Town of Paradise Valley	X							
City of Peoria	Х	X						
City of Phoenix	Х	Х						
PAG		Х						
RPTA	Х	Х						
Salt River/Pima/Maricopa Indian Community		Х						
City of Scottsdale	Х	Х						
Sky Harbor Airport		Х						
Swift Transportation		Х						
United Parcel Service		Х						
City of Tempe	Х	Х						

ITS Strategic Plan for Early Deployment in Maricopa County

To provide a base for the direction and goals of the EDP, the Steering Committee early on developed a vision and mission statement to guide the project objectives.

Vision: To deploy innovative ITS technologies in Maricopa County to satisfy regional transportation needs.

Mission: To interact with transportation users in order to identify community needs and objectives, and apply the appropriate technology consistent with the national ITS program to solve the area's transportation problems.

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ITS Strategic Plan for Early Deployment in Maricopa County

To date, the steering committee has had a well-attended monthly meeting on each of the following dates: December 14, 1994, January 11, 1995, and February 8, 1995. Complete meeting minutes are included in the **Appendix** document. Objectives accomplished during the meetings include the following:

Meeting: #1 December 14, 1994

- a. Welcome and introduction of all participants
- b. Overview of the project approach
- c. Review of the eight major tasks from project start to completion
- d. Selection of Jonathan Upchurch as Committee Chairperson and Cydney DeModica as the alternate
- e . Scheduling of the first five focus group meetings to be held in January

<u>Meeting #2</u> January 11, 1995

- a. Review of the ITS America video "Moving Transportation into the Information Age" in order to familiarize all committee members with various applications of ITS technologies that can be utilized to improve our present transportation system.
- b. Review of first focus group meeting.
- c. Discussion of possible ways to maximize the attendance and involvement at the upcoming focus group meetings.
- d. Scheduling of five more focus group meetings (10 in total).
- e. Development of a vision statement and a mission statement for the Strategic Plan.

Meeting #3 February 8, 1995

- a. Review of the attendance, findings and results of the 10 focus group meetings.
- b. Review of first regional meeting.
- c. Discussion of four possible plans for gaining greater public input:
 - 1. Hold public meeting after the plan is prepared.
 - 2. Utilize County comprehensive planning process.
 - 3. Additional focus groups.
 - 4. Citizens committees.
- d. Alternatives #3 and #4 seemed most possible.

Focus Groups

The focus groups were defined to encompass both public and private sector organizations that have an interest in advanced technologies as a means of solving existing and future transportation needs. Ten focus groups were formed. **Table 2** lists the focus groups and a sample of some of the groups that attended each meeting. The database listing the 200 invited focus group participants is provided in the separate **Appendix** document.

<u>Group</u>	Title	Sample Representatives
A	Transportation Agencies	Local cities and towns, RPTA, MAG, Maricopa County
В	Emergency Response	Police and Fire Departments, AAA, SkyView Traffic
C&E	Airport and Trucking	Airports, Car Rental, Airlines, Delivery Trucking Services
D	School	School Districts
F	Utilities	APS, Southwest Gas
G	Tourism	Chambers of Commerce, Office of Tourism
Н	Colleges/Universities	ASU, ASU West, Maricopa County Community Colleges
Ι	Major Employers	Loral, TRW
J	Special Events	Desert Sky Pavilion

Table 2 Focus Groups

The main purpose of the focus groups was to identify a broad base of specific transportation needs and to define those needs as short-, medium-, or long-term. A summary of the focus group findings is presented in the next section. A complete listing of the minutes and attendees can be found in the separate **Appendix** to this report.

The general outline of each focus group meeting was:

Welcome and Introduction - Focus group meetings typically began by everyone introducing themselves and telling what organization they represented and their position. The primary facilitator from Kimley-Horn explained ITS, how it got started and where it is today. The seven major categories of ITS services were defined and some examples given of each. The objectives of the Maricopa County ITS Early Deployment Strategic Plan were also explained.

ITS Video - "Moving Transportation Into the Information Age", a video sponsored by the USDOT, and presented by the Intelligent Transportation Society of America, was shown to each focus group to give coalition members a general understanding of ITS.

Presentation of ITS Strategic Planning Process - An outline of the strategic planning process for Maricopa County was presented. The flow chart shown in Figure 1 was discussed with the group.

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Additionally, the role of the focus groups, regional meetings, and steering committee was explained using the flow chart shown in Figure 2.

Presentation of Needs Identified in Other Studies - The review of existing information was presented to the focus groups. The purpose for presenting this information was to give participants an understanding of the studies that have been previously completed. These other studies will be reviewed during this project and needs identified in these studies will be included in the ITS Strategic Plan.

Identification of User Needs - The majority of the meeting was spent identifying needs of the participants. This portion of the meeting was divided into two parts. The first activity was a brainstorming session where user transportation needs were identified, regardless of whether or not they thought ITS could play a role in their solution. The second portion involved going back over all of the needs and defining each one as a short-, medium-, or long-range goal.

Section V summarizes each of the focus group meetings. A complete listing of the attendees, facilitators, and needs are contained in the **Appendix**, which is published separately.

Advisory Transportation Committees

The efforts to obtain input from the public regarding user needs was not successful. In an effort to augment the information sought in the Regional Public Meetings, several municipal transportation agencies were solicited, including:

- · City of Scottsdale Transportation Commission
- · City of Phoenix Transportation Subcommittee
- City of Glendale Transportation Advisory Commission
- · City of Tempe Transportation Subcommittee
- · American Truckers Association (non responsive)

Letters were forwarded by Kimley-Horn to each of these groups requesting placement on the next group's meeting agendas. All City transportation committees solicited responded favorably, and Kimley-Horn presented the Early Deployment process and vision, similar to the focus group meetings. Surveys were distributed and committee members were asked to prioritize the needs previously developed by the focus groups. Committee members were also encouraged to expand upon focus group needs by identifying additional transportation needs and deficiencies.

Correspondence related to this process, including completed survey forms, is located in the separate **Appendix.**

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Other Surveys

The same survey forms which were distributed to the Advisory Transportation Committees were also provided to other groups. For example, during National Engineers Week, surveys were provided to parents of a local Boy Scout group and a presentation of ITS applications made. Surveys were completed by these participants, as well as other groups (including Metro Center Mall) to give a random sampling of prioritization of focus group needs as well as additional transportation needs.

Even with diverse focus group, advisory transportation committee and community representation, it was determined that rural transportation goals may not be adequately represented. As a result, a number of individuals representing rural communities and individuals with experience in rural transportation applications were contacted to solicit these needs. Four major areas of concern were identified:

- · High water
- · Stranded motorists
- · Disabled vehicles
- · Commercial vehicle operations
- · Hazardous railroad crossings

These rural needs could be remedied through the application of ITS technologies, including:

- MAYDAY (in-vehicle distress notification)
- Automated road closure facilities for flooding
- Early railroad crossing warnings for motorists
- Adequate signage for animal and wildlife crossings
- Rural area emergency call boxes

Figure 11 shows the areas of Maricopa County that could most benefit from these rural ITS applications.

Institutional Barriers

When the MAGIC consortium was formed, a major obstacle in the area of institutional barriers became increasingly evident. Prior to an emphasis being placed on regional mobility, there was little incentive or demand for local agencies to cooperate with one another. Municipalities functioned as separate entities with regard to traffic control, and the various transportation providers managed and operated their operations without regard to industry or jurisdictional coordination. With increased public demand for greater and more efficient mobility, coupled with the incentive of federally-



funded transportation improvements, multijurisdictional coordination and cooperation is essential for the success of a regional ITS program.

Institutional barriers are not unique to Maricopa County. Several recent ITS studies and programs site the following as major obstacles to implementing regional transportation programs:

- Individual agencies that are resistant to change, and that may not strive for the common good.
- . Inability to maintain systems.
- · Liability and privacy concerns.
- · Inability to fund deployment and operation.
- . Lack of political leadership to "champion" controversial transportation policies.

In Maricopa County, the following barriers have been identified in previous studies and efforts associated with consensus and coalition building:

Traffic signal control, timing, and maintenance is highly parochial in Maricopa County. Most jurisdictions agree that information sharing needs to occur; however, control from the maintaining jurisdiction is not easily relinquished. In fact, a long-term disagreement exists in the Valley regarding what constitutes the most efficient signal phasing.

Commercial vehicle operators have raised several issues with regard to privacy. Commercial carriers generally agree that benefits can be derived from weigh-in-motion technologies; however, automatic logging and tracking of the vehicle creates a concern from the carriers' perspective due to minor discrepancies, mileage, weight, fuel consumption, etc., which ultimately get reported.

In focus group roundtables and surveys, it was emphasized that a widespread initiative should begin which is aimed at limiting single-vehicle occupancy use and creating incentives for alternative modes of public and non-motorized transportation. Transportation policy makers have long heard these arguments, yet the political leadership and community support for demand management is still lacking. Building additional facilities (i.e., bicycle lanes/paths), or providing more buses/area-wide service in and of itself will not have the significant impact needed for the motoring public to choose alternative modes. In addition, private partnerships will be critical in the implementation of such programs. ITS initiatives can automate transit, rideshare, region-wide dial-a-ride, and region-wide congestion pricing, thus making them more convenient and readily acceptable to industry and the motoring public; however ITS cannot establish the policies.

SECTION V - IDENTIFICATION OF USER NEEDS

Focus Group A: Municipal Transportation Organizations

Focus Group A brought together people from municipal transportation elements. The group included representatives from most of the cities in the Phoenix metropolitan area as well as MAG and RPTA. Most of the attendees deal with transportation issues on a day-to-day basis. Hence much of the brainstorming portion of the meeting centered around traffic signal systems and the implementation of the MCDOT MAGIC project recommendations.

Institutional needs were defined by many of the attendees. Among them were a need for both a high profile political leader to gain federal support for ITS projects and a local "champion(s)" that can garner local support for projects. The group also stressed the importance of jurisdictions working together to avoid duplication of effort and increased uniformity between their cities.

Other needs were identified regarding transit operations. Most agreed that the current system needs to be expanded and that rider information must be increased along with the system. The perception of rider safety, the availability of real-time schedule information, and an increase in overall efficiency and transit speed were also cited as needs.

Funding was another major category of needs. A lack of large, long-term funding sources was mentioned as a major concern. Many agreed that users are going to have to start carrying more of a responsibility in funding projects through user fees.

Also mentioned was the need for more accurate traffic information, environmentally sensitive solutions, and a focus on moving people not automobiles.

Focus Group B: Emergency Response

The Emergency Response focus group consisted largely of representatives from various police and fire departments from around the Valley. It also included people from SkyView Traffic, Metro Traffic, and AAA. The needs expressed by this group centered around incident management, and most were in agreement that better incident detection, communication, and incident removal are high priorities in their departments. Among some of the specific needs were call boxes along freeways, wider left side shoulders on arterials and freeways, improved vehicle access to areas adjacent to freeways and ramps, and a central clearinghouse of traffic incident data.

Some participants were concerned with highway construction activities. Specifically, the need for more nighttime construction was addressed. There was also expressed a need for better identification of routes for unfamiliar motorists, and coordination between jurisdictions on their

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construction projects.

Communications was a big concern to those present. Better communication procedures within and among jurisdictions was cited as one need. The need for improved communication to motorists about incidents and construction activities was also listed.

Focus Group C: Airport and Related Services

The Airport focus group consisted of representatives from Sky Harbor and Glendale Airports, several airline companies, rental car businesses, and delivery services. Most of their concerns were directly related to the operations at Sky Harbor International Airport. Commercial vehicle operations was cited as a particularly important problem to solve. With commercial vehicles in competition with passenger traffic on the west end of the airport, significant delays are caused in the 24th Street/Buckeye Road area. Exclusive access for commercial vehicles was mentioned as a potential solution.

More frequent bus service on the existing routes and additional routes to the airport were brought forth as a short-term need, as well as longer hours of bus operation. One of the participants explained that a person with a layover in the evening may be able to take a bus to Arizona Center but would have no bus available to return him/her to the airport in the late evening.

General operations at the airport was another category of concern. Keeping "through traffic" off of Sky Harbor Boulevard is an increasing problem as the Red Mountain Freeway (SR 202) nears completion through Tempe. Traffic originating downtown used to go north to Interstate 10 to get to SR 202. Now that a link has been completed between Sky Harbor and eastbound SR 202, some of that traffic is using Sky Harbor Boulevard as a shortcut from downtown. The holiday congestion problem and improving the curb management at all terminals is an ongoing concern for the airport.

Focus Group D: School Districts

Focus group D brought together several representatives from local school districts. Their concerns centered around transit and communications. In the transit area, improved safety on buses and at bus stops was cited as a short-term need. Expanded city transit would help ease the burden of the school districts owning and maintaining buses.

In the communication area, a need for more information and more accurate information on construction projects was expressed. Those present mentioned that rerouting buses is not a problem if enough notice is given regarding street closures.

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The group also agreed that it is important to know who is on the bus at what time. An example is when a student claimed to be on the bus when in fact he/she was not caused problems for one school district. Some type of passenger tracking or accountability system could prevent this from occurring.

Focus Group E: Trucking and Transport Services

An attempt was made to gather representatives from various industries involving trucking and transport. Due to various circumstances, none of the invited companies were able to attend the meeting. Subsequently, an effort was made to solicit information by telephone but response was very limited.

It should be noted, however, that the Focus Group C (Airport and Related Services) included representatives from the trucking and transport industries. Both Federal Express and the U.S. Postal Service participated. Much of the discussion in that focus group centered around commercial vehicle operations at the airport.

Focus Group F: Utilities

Focus Group F was put together to hear the needs of utility companies. Arizona Public Service and Southwest Gas representatives participated in the meeting. A lack of communication between agencies during multi-response events and the need for more communication to motorists, mainly on arterial streets, were concerns of the group, as was better communications when streets are closed. More accurate traffic information in general was cited as a need. They also wanted to improve the emergency response time for their vehicles by being able to avoid congested areas.

Focus Group G: Tourism

The tourism focus group had representation from the Phoenix and Tempe Chambers of Commerce, the Arizona Office of Tourism, as well as from Westcor and General Motors. Most of the needs described by this group did not necessarily describe needs for their particular industry but rather they were more general in nature. Incident management needs were cited many times including the need for real time incident information, minimizing slow downs, decreasing clean-up time, and ways of storing incident information for use in litigation.

The overall transportation network was a concern. Needs included finishing the freeway system quickly, providing more alternate routes for peak hour traffic, increasing capacity on streets with freeway ramps, and improving weaving areas (particularly the Broadway Curve/US 60 transition area).

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Trip reduction was also mentioned. More convenient methods of ride-sharing was one example, This could involve some type of computer on-line call-in system. Congestion pricing for commercial vehicles was brought up as well as an increase in telecommuting.

Focus Group H: Colleges and Universities

Representatives from ASU, ASU-West, and the Maricopa County Community College system were present for this focus group. Many of their concerns revolved around pedestrian, bicycle, and parking issues. Transit improvement suggestions included providing more bus routes, higher frequency, longer service hours, and improved security at bus stops.

Better integration of bikes with other modes of travel (such as vehicles and buses) was important to this group. Bike path continuity and linkage with city paths were also stated as needs. Pedestrians are also a primary concern, and making the campus areas more hospitable to them is important. Other means of alternative modes were cited as needing improvement: telecommuting, compressed work weeks, instruction by television, carpooling, and region-wide Dial-a-Ride.

Parking problems associated with availability, peak demand, information access, and decal renewal were other areas of need. Real-time parking information was mentioned as a possible solution to some of their parking problems. Automatic decal renewal was mentioned as a means of reducing problems at the beginning of the semester.

Focus Group I: Maior Employers

Focus Group I included representatives from TRW and Loral, and both expressed a need for improved transit. Currently no bus line serves either of these facilities. Parking is a major concern at TRW's Site I facility, and they are currently leasing space from McDonnell-Douglas to accommodate parking needs for their employees. Both groups said they could have a significant reduction in single occupancy vehicles if a bus line served their company.

A need for a region-wide ride-share program was given as a possible solution. This program could be made available on Internet so anybody with a computer could dial in to obtain ride-sharing information.

Focus Group J: Special Events

The only representative that attended this focus group was from Desert Sky Pavilion. Many of the needs mentioned dealt with parking. The need for more advanced parking information (both pre-trip and en route), ways of shuttling event-goers from remote lots, better signage, and quicker payment methods were the primary needs.

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Developing special signal timing and phasing for event-generated traffic was identified as a need. Another is a way of diverting and/or alerting non-event traffic around the venue. Also mentioned is a need for remote control of signals rather than have law enforcement manually directing traffic.

Regional Meetings and Subsequent Surveys

Regional Public Meetings - Four regional public meetings were scheduled to gather input from citizens throughout the Valley. It was envisioned that results from the focus group meetings would be brought before the public for further input and feedback.

Public notification regarding the regional public meetings was sent to 75 newspapers, television and radio stations. Of those 75 media contacts who were sent a news release, 30 confirmed using it. Since the majority of the broadcast media contacts do not track public service announcements, we confirmed that at least five of the above 30 actually ran this press release. These five include KTSP Channel 10, KZON FM, KOY AM. The Phoenix Gazette and the Arizona Republic. Combined they reached a total of more than 692,000 people. A copy of the news release is contained in the separate **Appendix** document. Due to a lack of attendance at the first meeting, subsequent meetings were postponed in accordance with recommendations from the Steering Committee.

As mentioned previously in Section IV, several alternative sources of information were sought to augment the cancelled regional public meetings. Surveys were sent to several city transportation committees, as well as distributed to the general public. Copies of these surveys are included in the **Appendix.**

Summary of User Needs

Table 3 on the following page illustrates the needs identified by the focus groups, surveys and studies.

Ca	itea	Drv	Surveys	Studies				F	ocus	Grou	p				# of	Total
	Ne	ed	All and a second second		Α	B	C	D	E	F	G	H	1	J	Groups	Count
A.	Pul 1	AVI for buses	· ·										<u> </u>			1
	2	Additional and more accurate real time info. on transit locations, efficiency, and ridership	~													1
	3	Computerized ride share program (Valley wide)	~										~	~	2	3
	4	Coordination of smart hwy/traveler into, system w/ transit and ride share	~													1
÷.	6	Express routes to non-downtown locales								V			V		2	2
	7	Improve efficiency of exit, bus routes and system	~												4	
		Improved safety at bus stops			V	~		~							3	3
	10	More frequent service	~				~				1	V			2	3
	11	More hours of service			~		~	~		~	-	~	~		6	7
1	13	Rail System	V				V						-		1	2
	14	Real time information on schedule	~		2						 				1	2
	15	Reduced trip time			~							~			1	2
	17	Transit/Shuttle Buses for Special Events									~				1	1
	18	Visual and/or sound announcements for hadicaped transit travelers	V			L 5 2	1 ^{43,} 1, 1, 74	3 600 · × 540		وعلم المكورتين				9.5.1	(Fight of Care)	1
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.		Coordination between agencies		V	V	V				V					3	4
		ITS Education			V										1	
	4	More focus on moving people not autos			7									·	1	1
		Valley-wide uniformity of traffic control		~	v		~								2	3
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		Central clearinghouse for incident information			V										1	1
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ŀ.		Congestion pricing for commercial vehicles				1								<u>v</u>	1	
		Implement congestion management methods														
1.2		Improve regional mobility		v		[ļ									1
	10	Improved traffic control at special events									<u> </u>			~		3
		Incident detection and notification to motorists	~	~		~				V				V	3	5
	13	Increase in carpooling incentives									ļ	~			1	1
	14	Increase of telecommuting									+					<u>1</u>
	10	More Hov lanes				V									1	1
	1	More extensive and integrated bike paths			İ		 		ļ			~			1	
Ľ.	18	More traffic data to plan infrastr. improvements											~	~	2	2
	20	Real-time in-vehicle displays of traffic information	~								~				1	2
	21	Reduce accidents at intersections		~			<u> </u>	ļ		-	ļ	ļ				<u> 1</u>
	22	Reduce congestion & delay on streets and freeways		~												
	24	Reduced "rubber-necking"												V	1	1
1	25	Reduced congestion at airport					1								1	
	20	Region-wide communications infrastructure		<u> </u>			~	 							1	
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10		Computerized signal control			~	[1	1
	Ŀ	Coordination between FMS and city signals			~										1	
1.5		Improve bandwidth of comm. infrastructure	~					<u> </u>				L				1
		Increased manpower to operate/maintain			~										1	
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		Advance notice of animal crossings in rural areas	~		Ė											1
		Better detour signage				1	<u> </u>	<u> </u>	<u> </u>		 				1	
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1		High water crossing warning and detour	~													1
1.78 1.76 1.76 1.76		More efficient parking payment			ļ			ļ	ļ		1	ļ				
		More information on street operating conditions	· · ·					 		-	1	1			1	2
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Table 3

Summary of Needs Identified by Focus Groups, in Surveys and in Studies

SECTION VI - SUMMARY

The success of developing ITS technologies in Maricopa County will be highly dependent upon the ability to eliminate institutional barriers and implement technologies to improve the regional transportation network. Task 1 of the Maricopa County ITS Strategic Plan focused primarily on establishing a coalition from varied public and private agencies throughout the Valley and determining the community's transportation needs.

The Steering Committee formed for this plan includes many of the MAGIC participants, but has been further expanded to include additional public and private ITS stakeholders. The coalition also includes participants from several focus groups and local transportation advisory committees. All have provided valuable project input.

The resulting needs have focused upon traffic management, traffic signals, and public transit issues. Funding and political leadership were often cited as critical factors to the success of ITS in Maricopa County. Looking at the needs in a relational manner revealed that many mobility and system topics focused upon the need for sharing information, both to the motorist and among jurisdictions. This need for information was stated in the MAGIC study, and was echoed and expanded in these early deployment planning efforts by school systems, transportation managers, special event promoters, and the tourism industry.

It will be these needs that serve as the cornerstone for the building of a Strategic Plan, developing a system architecture, and making the coalition's vision of deploying innovative ITS technologies in Maricopa County to satisfy regional transportation needs a reality.

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