MIAMI VALLEY ITS

PROJECTS

Projects

6.0 PROJECTS

6.1 OVERVIEW

This Section presents recommended ITS projects for the Miami Valley within the context of an integrated lTS Strategic Deployment Plan containing the following six program areas:

1: Freeway/Incident Management Systems
2: Advanced Traffic Signal Control Systems
3: Public Transportation Systems
4: Multi-Modal Traveler Information Systems
5: Public-Private Partnerships
6: Technical and Planning Support

6.2 PROJECT AND PROGRAM AREA DEVELOPMENT PROCESS

The projects and program areas presented here represent the culmination of the ITS strategic deployment planning process for the Miami Valley and reflect all of the activities conducted to identify transportation needs, ITS opportunities and local transportation agency and other stakeholder needs and preferences. These activities, which are summarized in Sections 2.0 - 4.0 of this report, include newsletters, surveys, interviews, workshops and data collection and analysis.

The specific effort to develop projects began during with the Workshop Intensive held in January 1997 with the Policy and Technical Committees. In anticipation of the workshop, the consultant team prepared a "master list" of potential lTS strategies/projects in each of several subject areas. This list was discussed and revised during the workshop. The resulting list was then prioritized by the committee members. The results of that ranking are shown in Section 3.5 of this report.

Following the ranking of potential ITS strategies/projects, committee members broke up into small groups by subject area to produce a "final" ranking of the strategies relevant to their area and to develop more detailed descriptions of their group's highest ranking strategies/projects. The strategy/project rankings by group are as follows:

Freeway/Incident Management Group

This group equated potential ITS projects with categories of Miami Valley area freeway/incident management problems and offered suggested locations for freeway/incident management system deployments in the following locations. Strategies/concepts that were found to have ***potential*** application to the Miami Valley include the following (in no particular order):

- Detection Systems
- Ramp Meters

- Surveillance Cameras
- Changeable Message Signs
- Highway Advisory Radio
- Service Patrols
- Cellular Hotline System
- Incident Response and Clearance Procedures/Protocols
- Database of Scheduled Incidents (Maintenance, etc.)

The candidate locations for implementation of freeway/incident management consist of:

- I-75 from I-675 in the south to Northwoods Boulevard (Vandalia) in the north
- I-70 from Airport Access Road in the west to State Route 41 in the east
- I-675 from I-75 in the south to I-70 in the north
- US 35 from the planned SR 49 Relocation (the Trotwood Connector) in the west to the east side of Xenia
- State Route 4 from I-75 in the south to I-70 to the north

Advanced Traffic Signal Control Group

This group prioritized potential strategies/projects as follows:

- Advanced Traffic Control Systems
- Signal Timing and Synchronization
- Regional Traffic Management Control
- Multi-jurisdictional Signal System Coordination
- Regional Project Management
- Surveillance

Public Transportation Systems Group

This group prioritized potential strategies/projects as follows:

- AVL Transit Management System
  - Schedule adherence monitoring (incidents)
  - Flexible services
  - Automated collection of run time, loading and mileage data (for planning and more achievable schedules
- Traveler Information System - First Static, then Real-Time
  - Kiosks at hubs
  - Internet
  - On-Board Annunciators
  - Active Station Signs (major stops)

- Mobility Management System
  - Single user interface/“seamless” information and reservation
  - Coordination among providers
- Safety/Security Monitoring (Cameras, Silent Alarms)
  - On-Board
  - Facilities (parking lots, etc.)
- Traffic Signal Priority
- Data Feed from/Coordination with Traffic Management Center

Traveler Information Group

This group prioritized potential strategies/projects as follows:

- Media Reports (TV, Radio)
- Changeable Message Signs
- Cable TV
- Highway Advisory Radio Broadcasts
- Automated Telephone Systems
- Internet
- Active Transit Station Signs
- Pagers
- Kiosk
- Fax Services/E-mail
- Pavement/Weather Sensing Stations
- Bulletin Board
- In-Vehicle
- On-Board Transit Information
- Portable CMS and Highway Advisory Radio
- Personal Communication Devices
- Interactive Television

The members of each breakout group were asked to develop more detailed descriptions of each of their highest priority strategies/projects by answering the following questions:

- What is the purpose of this project? What problems does it address?
- What is a good location for this project? Where should the project expand to?
- Who would lead the project and what other organizations would participate and how?
- What are the steps in the deployment process?
- How could this project be funded?

The results of these exercises provided an excellent foundation for the project development process. Over a period of several months, project descriptions were developed by the project team and revised based on committee input. Throughout the project development process, the “overriding factors” that were identified by the committee to guide project development were consulted (the overriding factors are listed in Section 3.4 of this report).

6.3 PROJECT DESCRIPTIONS

The project descriptions that follow are organized according to the six recommended ITS program areas. Each program area includes a summary of the objectives of the program area, an overview of the projects which it includes and a table which indicates the relative deployment phasing of the projects in terms of four time periods: Immediate (years 1 and 2), Short-Term (years 3 through 5), Mid-Term (years 6 through 10) and Long-Term (years 11 through 20). Each project description includes the following elements:

- Objective
- Current Conditions
- Scope
- Location
- Technology
- Administration
- Time Frame

Generally, "projects" relate to a specific area of activity or function, e.g., "detection/verification". Specific locations and steps in the deployment of a project are generally referred to as "project phases" and are delineated separately within the "scope" section of each project description.

PROGRAM AREA: 1 - FREEWAY/INCIDENT MANAGEMENT SYSTEMS

DESCRIPTION: This program area consists of an integrated freeway management system capable of monitoring traffic conditions on the freeway system, identifying recurring and non-recurring flow impediments, implementing appropriate control and management strategies and providing critical en-route information to freeway travelers. The objective of this program area is to develop a comprehensive cost-effective freeway management system for the Miami Valley that will reduce congestion and accidents and improve incident detection, response and clearance along the freeways and provide for the integration of other program areas.

Freeway/incident management techniques can significantly improve the safety and capacity of roadways. However, they are not a "substitute" for all types of "traditional" capacity improvements. Freeway/incident management techniques should be considered as part of a comprehensive program to address transportation needs.

The ultimate vision for the study area includes an integrated system of freeway/incident management control facilities, or, depending upon operating experience during the initial phases of the deployment and the preferences of participating local jurisdictions, a single regional control facility. These facilities, or facility, will perform the monitoring and control functions required to operate the freeway/incident management system, including monitoring and control of closed-circuit television cameras, changeable message signs and potentially, ramp meters.

Implementation of advanced traffic management systems for freeway management purposes has demonstrated measurable benefits over an extended period of time and across a variety of measures of effectiveness, including travel time, travel speed, freeway capacity, safety, fuel consumption and emissions. Analyses of systems in several metropolitan areas, including Seattle, Minneapolis, Detroit, Chicago and locations in California, indicate the following system benefits may be achieved.

- Travel time decreases of 20% - 48%
- Travel speed increases of 16% - 62%
- Freeway capacity increases of 17% - 25%
- Accident rate decreases of 15% - 50%
- Significant reduction in fuel consumption
- Significant reductions in vehicle emissions *(Intelligent Transportation System Infrastructure Benefits: Expected and Experienced,* USDOT, June 1996).

With the ability to increase capacity by up to 25 percent and a per mile cost between $250,000 and $500,000, freeway/incident management is often a far more cost effective approach to increasing capacity in congested, heavily urbanized areas.

The freeway/incident management system represents the backbone for the regional traveler information system because the vehicle detection system, closed-circuit television system and reports from service patrol vehicles will provide the primary source of data on regional freeway traffic conditions.

The projects in this program area are divided into those which implement detection/verification capabilities, freeway traveler information, traffic control, incident management and traffic control facilities.

- Detection/ verification project phases include deployment of regional vehicle detection, cellular hotline reporting system, CCTV camera and enhanced reference marker systems.

- Traveler information project phases include deployment of a regional changeable message sign system, highway advisory radio and implementation of localized advanced traveler information systems at major traffic generators, such as shopping and event facilities.

- Traffic control project phases will examine the need and feasibility of ramp meters at specific locations throughout the Miami Valley, and if found to be needed and feasible, implement ramp meters.

- Enhanced incident management project phases provide portable traffic management systems for use in work zones, special events and other non-reoccurring freeway traffic situations, and develop specific plans that will identify how the freeway management infrastructure will be utilized during incidents and how the existing incident management process can be integrated with the freeway management process.

- Traffic control facilities projects will deploy the facilities necessary to monitor and control the freeway management system.

A phased approach is recommended for implementing the Miami Valley Freeway/Incident Management System. The recommended system will be phased both geographically and by technology based on needs and opportunities. Non-ITS construction projects provide an important opportunity to install portions of the roadway infrastructure required for freeway/incident management (as discussed in greater detail in Section 7.0 of this report).

Figures 6-l through 6-4 illustrate the status of the freeway/incident management system deployment at the end of the Immediate (Years l-2), Short (Years 3-5), Mid- (Years 6-10) and Long (Years 11-20) terms.

RATIONALE: The program area supports the following Overriding Factors that were developed for the Miami Valley ITS Strategic deployment plan:

- Addresses Safety
- Reflects a Region wide Perspective
- Serves Many
- High Visibility
- "Early Winner"
- Acceptable Risk-to-Benefit Ratio
- Maximizes Resources

EXPECTED RESULTS: This program area addresses the following freeway/incident management problems identified during the development of the Miami Valley ITS Strategic Deployment Plan:

- Incident-Related Congestion due to:
  - Lack of Incident Detection
  - Inadequate Incident Response
  - Lack of Incident Information
- Congestion caused by Special Events
- Congestion caused by Limited Capacity/Geometric Design
- Inadequate Work Zone Traffic Control/Information.

This program area will address the following User Services:

- Traffic Control
- Incident Management
- Emergency Vehicle Management
- Demand Management and Operations
- En-Route Driver Information

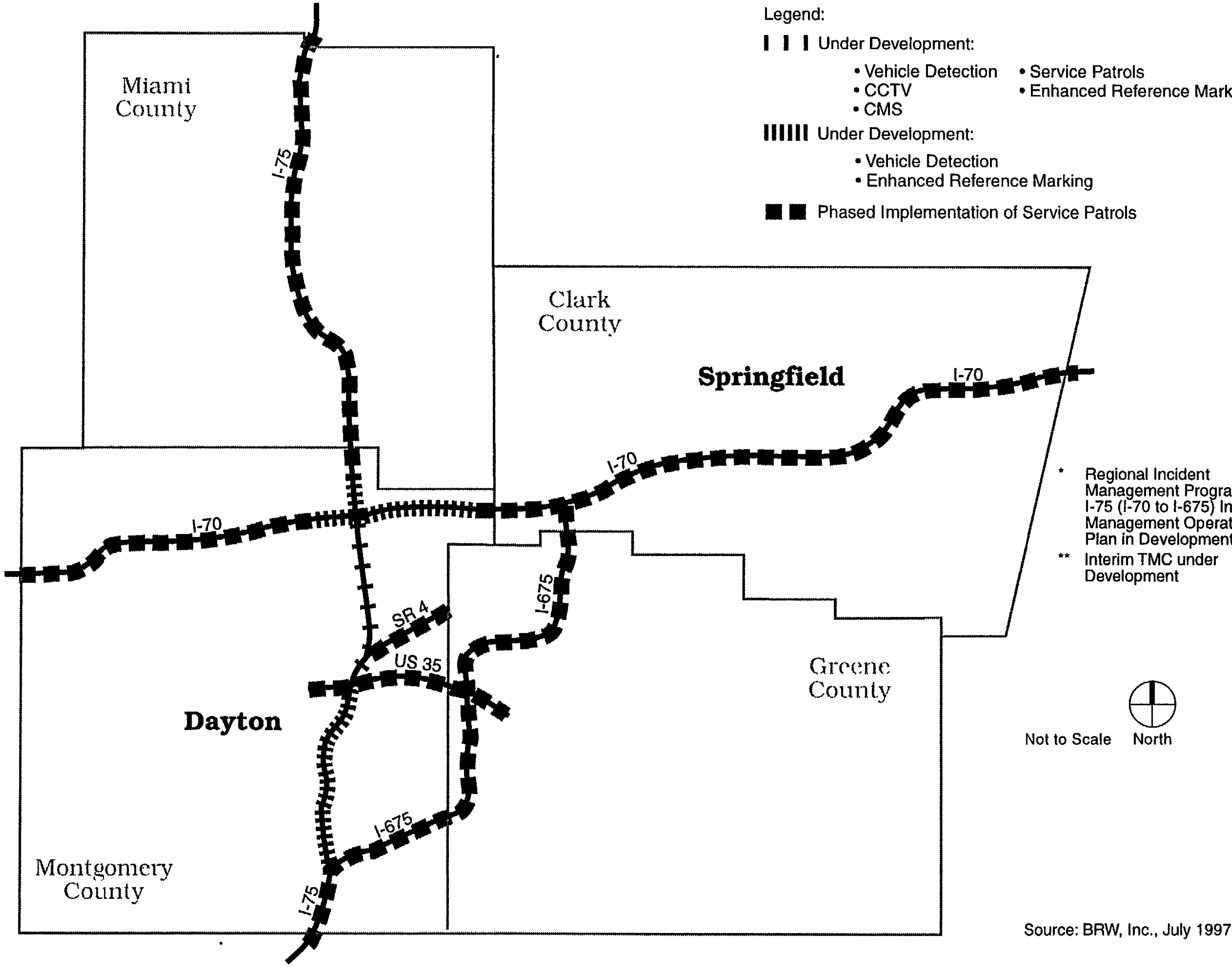

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Figure

Freeway/Incide
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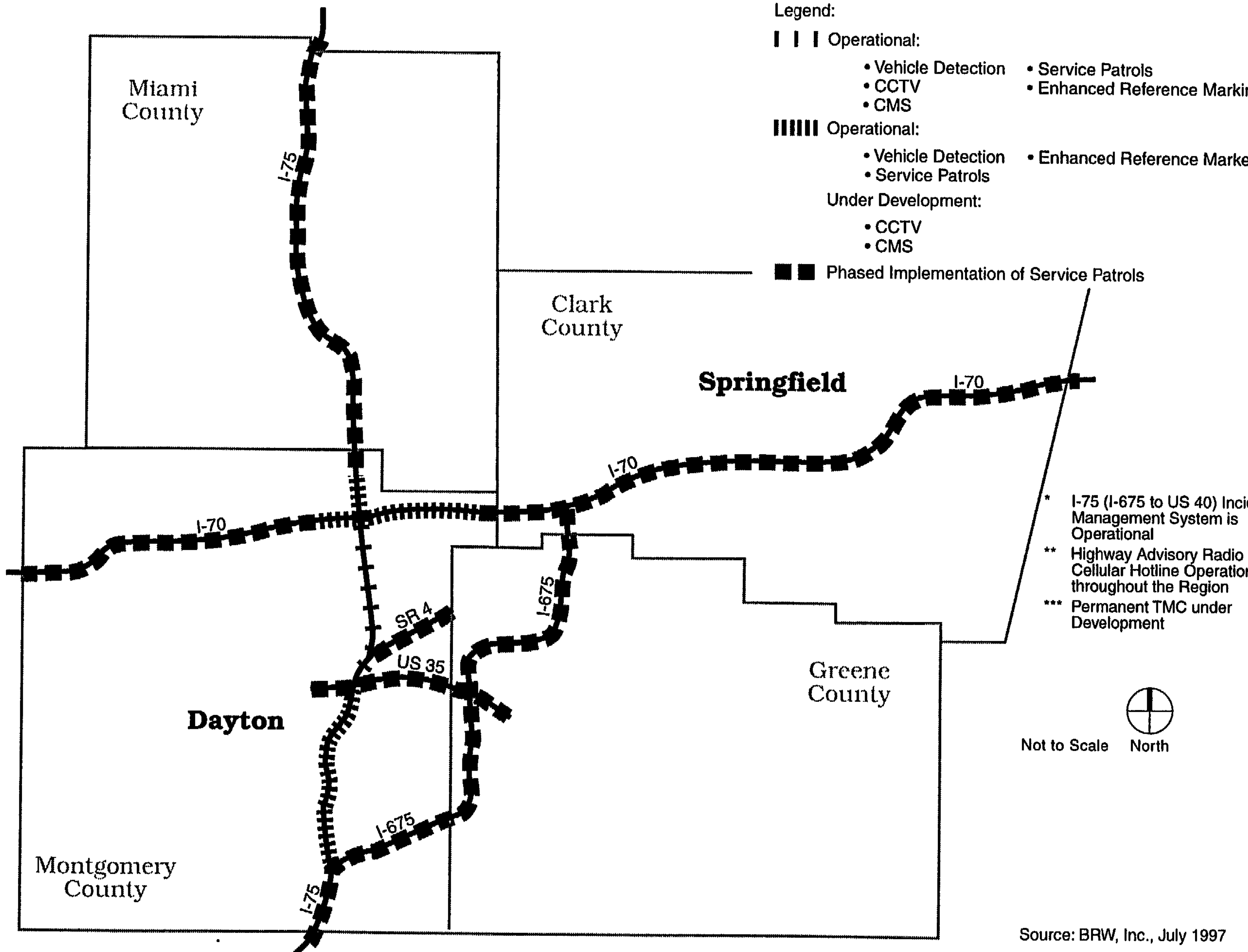
End of Year 2 (Immediate-Term



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Freeway/Incide
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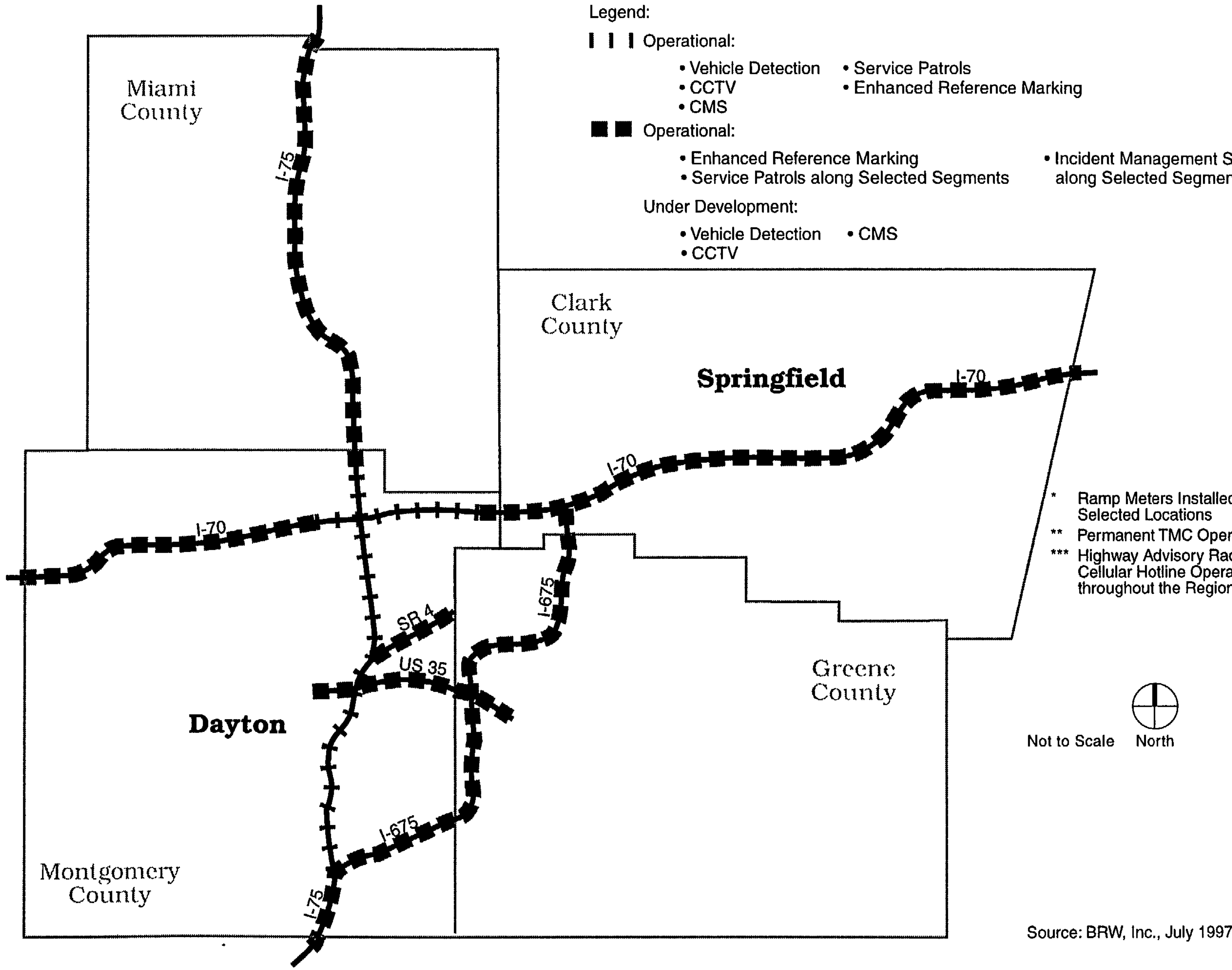

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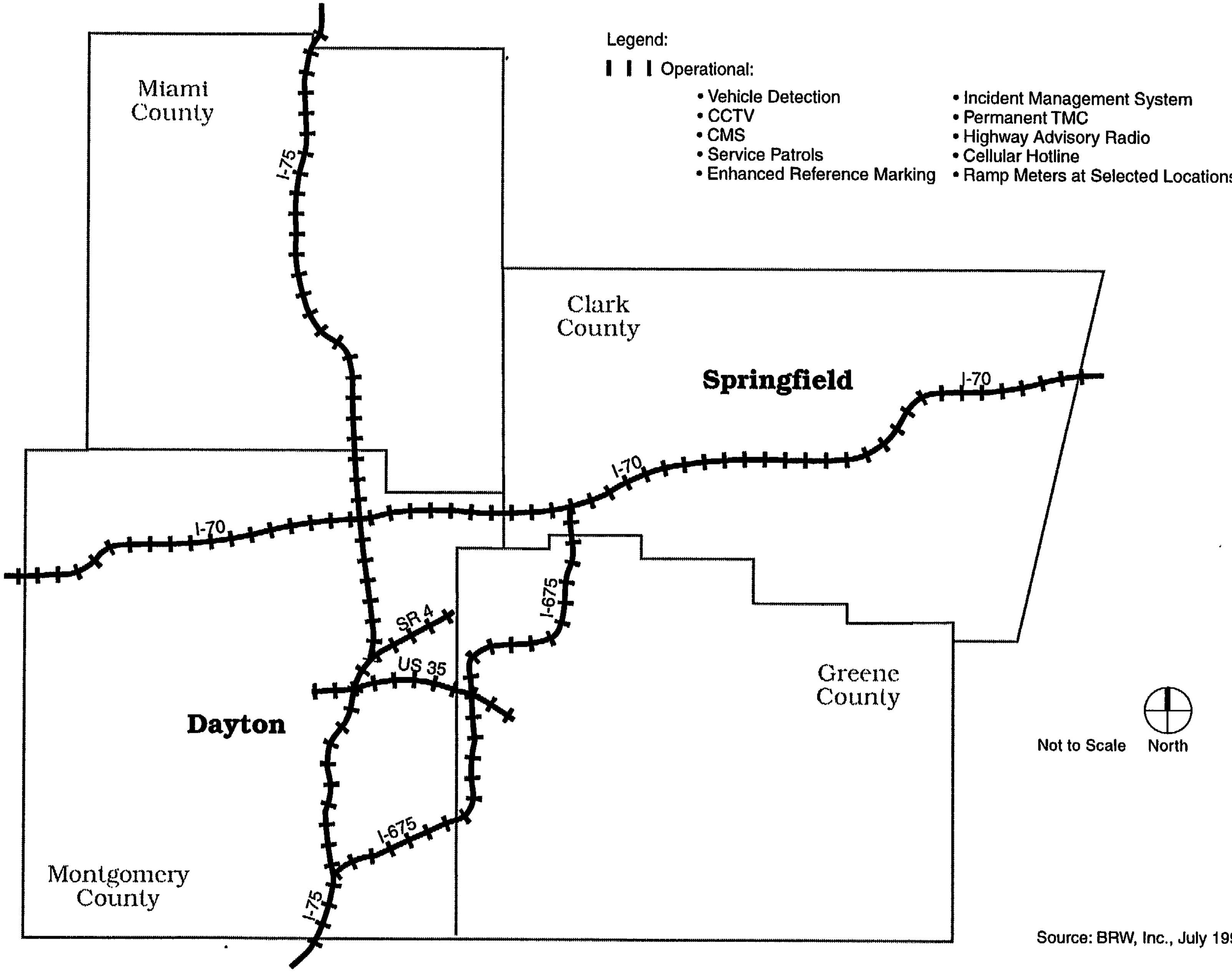

Source: BRW, Inc., July 1997

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Freeway/Incide
Management System Statu
End of Year 20 (Long-Terr

	Implementation Timeframe						
	Year					Year 6-10	Year 11-20
1. FREEWAY/INCIDENT MANAGEMENT SYSTEMS	**1**	**2**	**3**	**4**	**5**		
1.1 Detection/Verification							
1.1.1 Service Patrols	X	X	X	X	X	X	X
1.1.2 Phase I Detection System (I-75 from I-475 to US 40 and I-70 from SR 48 to SR 201)	X	X	X	X	X		
1.1.3 Phase II Detection System (Remainder of Freeway System)						X	X
1.1.4 Regional Cellular Hotline Incident Reporting System			X	X	X		
1.1.5 Phase I CCTV Camera System (I-75 from US 35 to I-70)			X	X	X		
1.1.6 Phase II CCTV Camera System (I-75 from I-675 to US 35 and from I-70 to US 40; I-70 from SR 48 to SR 201)	X	X	X	X	X	X	
1.1.7 Phase III CCTV Camera System (Remainder of Freeway System)						X	X
1.1.8 Phase I Enhanced Reference Markers (I-75 from I-675 to US 40)	X	X	X	X	X		
1.1.9 Phase II Enhanced Reference Markers (Remainder of Freeway System)						X	
1.2 Traveler Information							
1.2.1 Phase I Freeway CMS (I-75 from US 35 to I-70)	X	X	X	X	X		
1.2.2 Phase II Freeway CMS (I-75 from I-675 to US 35 and from I-70 to US 40; I-70 from SR 48 to SR 201)			X	X	X	X	
1.2.3 Phase III Freeway CMS (Remainder of Freeway System)						X	X
1.2.4 Highway Advisory Radio				X	X		
1.2.5 Major Generator/Local ATIS Study	X					X	
1.2.6 Major Generator/Local ATIS Implementation		X		X		X	
1.3 Traffic Control							
1.3.1 Ramp Meter Study		X					
1.3.2 Ramp Meter Implementation						X	X
1.4 Enhanced Incident Management							
1.4.1 Portable Traffic Management System	X						
1.4.2 Regional Incident Management Task Force and Regional Memorandum of Understanding	X						
1.4.3 Regional Incident Management Program Plan	X						
1.4.4 I-75 Incident Management Operational Plan		X					
1.4.5 I-75 Incident Management System		X					
1.4.6 Regional Incident Management System		X	X	X	X		
1.5 Traffic Management Facilities							
1.5.1 Interim Control Facilitie(s) Design	X						
1.5.2 Interim Control Facilitie(s) Implementation		X	X				
1.5.3 Permanent Control Facilitie(s) Design					X		
1.5.4 Permanent Control Facilitie(s) Implementation						X	

PROJECT: **1.1 - Detection/Verification**

Objective: The objective of this project is to support the implementation of a freeway management detection/verification system in the Miami Valley capable of detecting and verifying incidents, minimizing incident response and clearance times, providing adequate data for related control functions such as ramp metering and for providing the freeway operating conditions information, including congestion levels and/or travel times, to be used in traveler information dissemination.

Current Conditions: For the purposes of the Strategic Deployment Plan, the freeway system in the Miami Valley has been defined to include the following segments:

- I-70
- I-75
- I-675
- US 35 (from approximately James H. McGee Boulevard to westbound SR 835)
- SR 4 (from I-75 to just north of SR 444)

With the exception of an Incident Management Plan for I-75 through the City of Dayton, the study area freeway system does not include any of the typical components of freeway management systems. There are no ramp meters, changeable message signs, highway advisory radio, vehicle detection stations, weather detection stations or enhanced signage for motorist reference. The Incident Management Plan includes a number of pre-defined detour routes and manually operated flip-down detour signs along I-75. The system is not frequently used, in part due to the time required to manually deploy the detour signs.

Freeway conditions are currently detected and reported via motorist reports, by media/private traffic reporting services and by law enforcement patrols. Private party reports are made primarily en-route via cellular phones to radio stations, private traffic reporting services or .to law enforcement/emergency service agencies. Private traffic information sources, consisting of the media and Traffic Watch, Incorporated, a private provider of traffic information, gather their information from private party reports, coordination with/monitoring of law enforcement sources and through their own field units. Law enforcement information is gathered primarily through field patrols.

Freeway information is currently disseminated via radio and television outlets, most of which coordinate to some degree with public information sources such as the Ohio Department of Transportation and law enforcement.

A privately operated motorist assistance van program is currently operated by the Samaritania Corporation during limited times and within a limited geographic area. The Samaritania program recruits local commercial sponsors who receive advertising (logos on the side of the van) in exchange for their support.

Scope: 1.1.1 Service Patrols

This project consists of implementing service patrols along selected portions of the Miami Valley freeway system. Identification of specific segments for patrolling should be made based on ongoing analyses of accident and congestion information. At a minimum, initial deployment should include I-75 from US 35 to US 40, the area targeted for early action in the Freeway/Incident Management System Program Area. The recommended geographic phasing of the service patrol program is shown in Figure 6-5.

Specially equipped vehicles operated by specially trained staff will patrol preestablished routes. The patrols serve both as a form of detection--other service patrol programs indicate that a high percentage of incidents are initially detected via the patrols--and as an incident management tool, providing a number of services which are designed to minimize the detrimental impact of breakdowns and incidents on traffic operations.

Service patrol vehicles are typically equipped with two-way communications devices and a wide range of materials and equipment useful in providing motorist aid, including gas cans, tire jacks, etc. The focus of the patrols is providing aid to stranded motorists. Although freeway service patrols may be configured so as to play a proactive role in incident management, patrols typically do not replace the role played by law enforcement, towing companies or emergency service agencies. The specific roles of the service patrols relative to incident management should be delineated through a coordinated and comprehensive process to develop incident management procedures.

Typical service patrol coverage is one vehicle for every 30 miles and a ratio of approximately two drivers per vehicle, operating in shifts. The patrolling of segments would be flexible and may change following initial implementation, depending upon the number of response vehicles, the

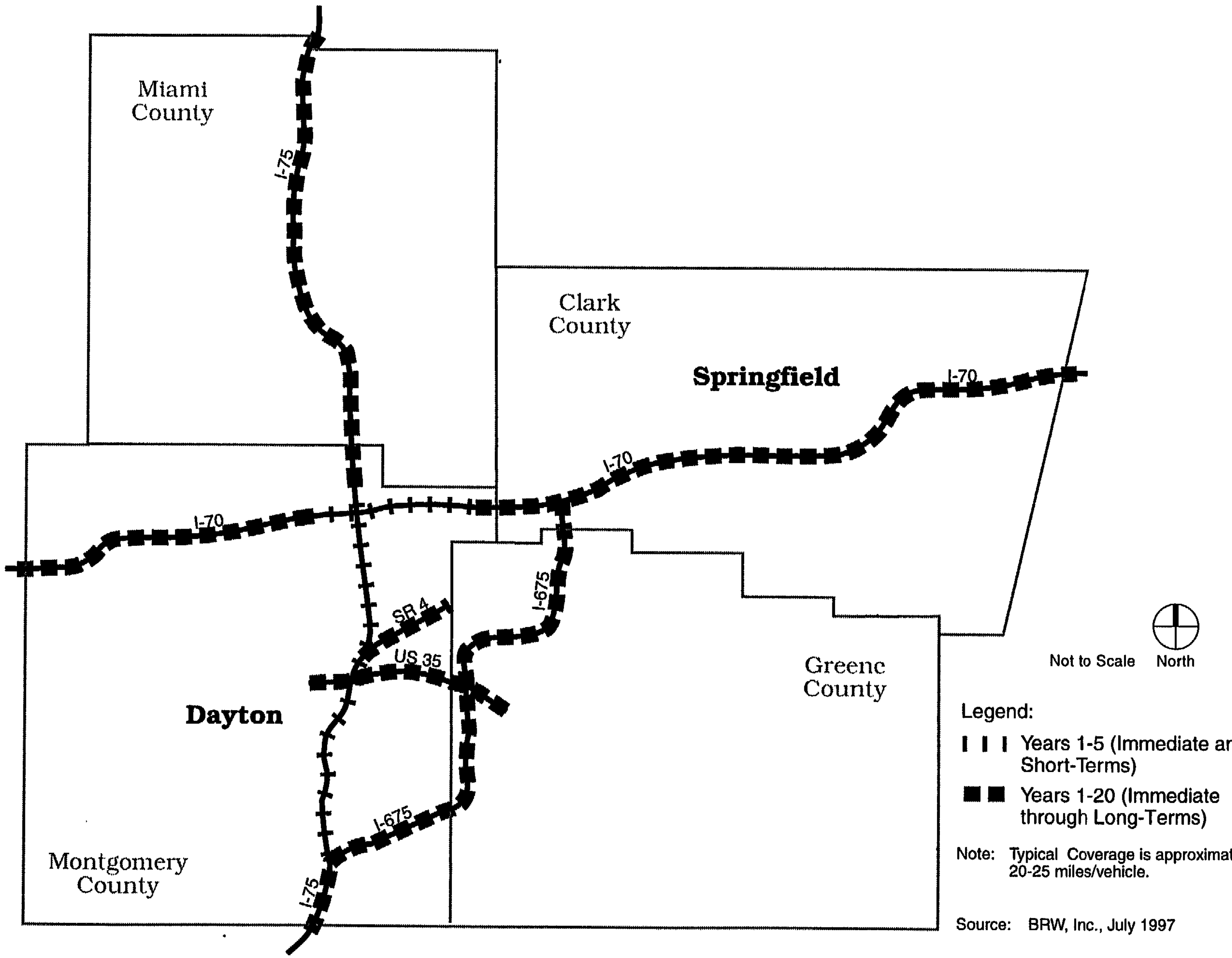

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Figure

Freeway Service Patro
Proposed Implementation Phasi

traffic demand and the number of incidents along different segments. Initially, service patrols may only be present during the peak traffic demand periods on weekdays and during special events. Ultimately, the patrols may be present for 10-l 5 hours per weekday, 8-10 hours on weekends and during special events or the patrols may be continuously present.

In addition to the varying levels of responsibility that are possible relative to incident management, the amount of control given to patrol drivers for controlling elements of the freeway management system such as changeable message signs, ramp meters, etc., can be adjusted. Traditionally, patrols have been given little if any control of freeway management system elements with their interface with the system being limited to voice and data communications with a base station, which in turn will take the appropriate actions. However, in cases where a more decentralized approach to freeway/incident management is desirable, selected functions have been delegated to the service patrols, thus reducing the resources required for control center(s).

The decentralized service patrol control philosophy is currently being pursued by the Indiana Department of Transportation along the Borman Expressway in Northwest Indiana, where service patrols are equipped with sophisticated wireless communications systems which allow a degree of remote control of changeable message signs and in-vehicle "expert systems" are used to automatically identify a range of appropriate incident response actions via computer. The implementation of service patrols in this project phase assume the more traditional role of the patrols.

As discussed further in Program Area 5, freeway service patrols represent an important opportunity for partnership with the private sector. As noted under the Current Conditions section of this project, the Samaritania Corporation current operates a very limited commercially sponsored motorist assistance program in the Miami Valley. In Cincinnati and several other major cities, the public sector contracted for service patrol operation through Samaritania with the public and private participants roughly splitting the cost of the service. Such an arrangement has obvious cost savings benefits but will obviously impact the role of the service patrol vehicles, especially during incidents. For the purposes of the Strategic Deployment Plan, this project is described as an entirely public program. However, partnership with the private sector should be given serious consideration as the details of the program are developed.

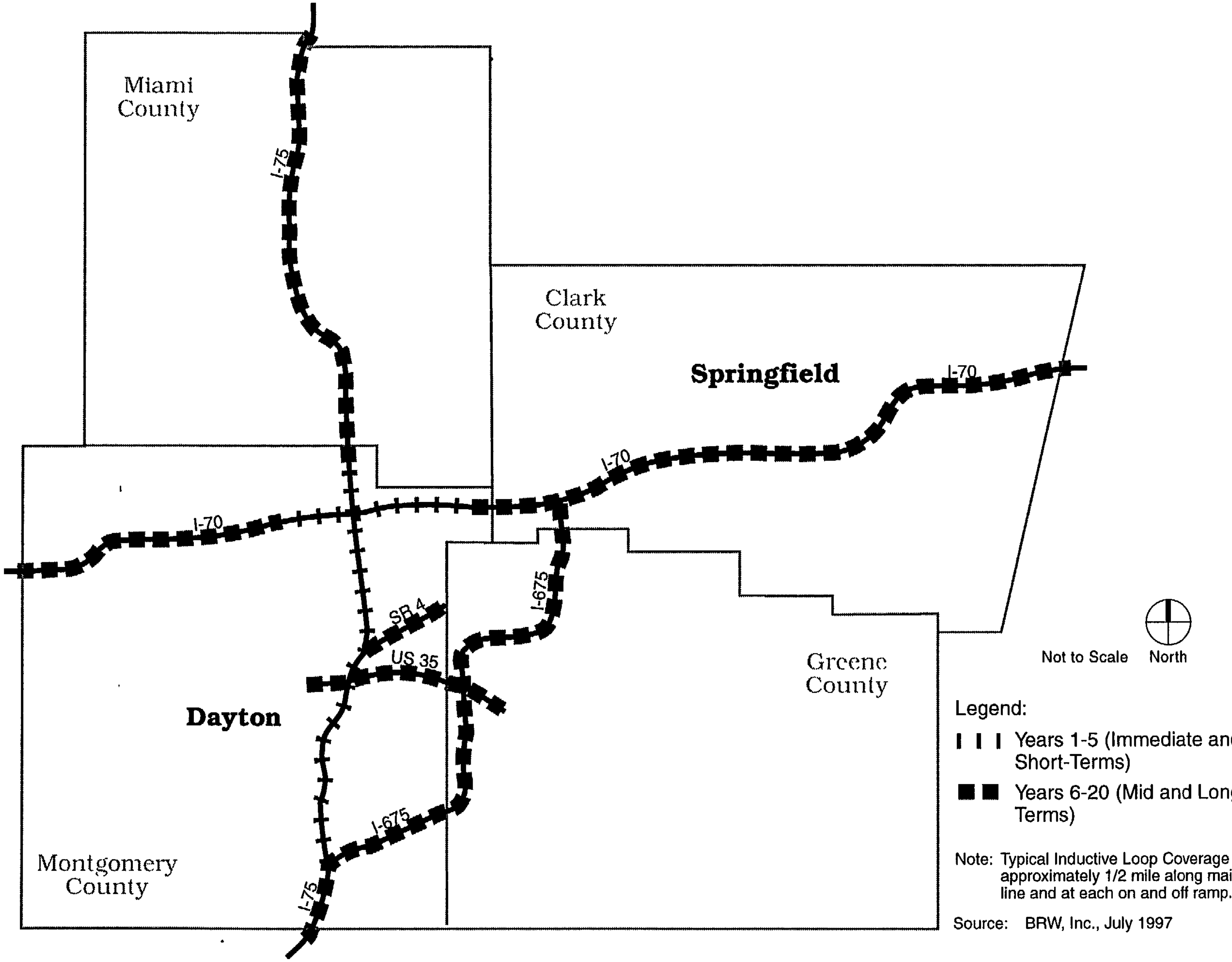
1.1.2 Phase I Detection System (I-75 from I-675 to US 40 and I-70 from SR 48 to SR 201)

This project implements the first phase of the vehicle detection system, the foundation for the freeway/incident management system. The detection system will extend over approximately 28 centerline miles along I-75 from I-675 to US 40 and along I-70 between SR 48 and SR 201. This project phase includes the fiber optic cable which will connect all of the detector devices and which will serve as the "backbone" for subsequent connection of CCTV, CMS and all other ITS devices. Figure 6-6 illustrates the recommended deployment phasing of the regional vehicle detection system, including project phases 1.1.2 and 1.1.3.

The data collected through the detection system will be used for a wide range of ITS applications and represent critical inputs to a number of subsystems. For example, detector data can be analyzed automatically and in real time to identify traffic flow conditions which indicate that an incident has occurred, average travel speeds and associated measures of levels of service can be calculated, and detector information can form the basis for ramp metering timing strategies. The specific data to be collected includes traffic count, speed, occupancy (density) and classification information.

A relatively wide range of vehicle detection technologies are currently available with new, or variations on old, technologies being introduced daily. Current options include a range of intrusive (e.g., inductive loops, magnetometers, axle counters) and non-intrusive (e.g., microwave/radar, acoustic, and machine vision) devices.

Given the rapid pace of technological change in this area, the decision of which type or types of technologies should be utilized should be made during the design of the detection system, during Year 1 of the ITS deployment. *The Technologies Analysis Working Paper* (March 1997) completed as part of the Miami Valley ITS Strategic Deployment Plan process, discusses the relative strengths and weaknesses of alternative detection technologies and should be consulted when selecting specific detection technologies. Ultimately, a combination of various detectors may be selected. The Appendix includes a diagram showing the typical components of a detection system at a freeway interchange, based on inductive loop technology, and an illustration of a typical side-mounted, non-intrusive detector installation.



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Freeway Detection Syste
Proposed Implementation Phasi

For estimation purposes, the cost of this project was calculated assuming inductive loop vehicle detection technology with a spacing of four stations per centerline mile and an average cost per centerline mile of $40,000. The cost of fiber optic cable has been assumed at $120,000 per centerline mile.

1.1.3 Phase II Detection System (Remainder of Freeway System)

This project will consist of expanding the vehicle detection and fiber optic backbone communications system to the remainder of the Miami Valley freeway system (as defined under the Current Conditions portion of this project description), a distance of approximately 110 miles. The recommended phasing of the regional detection system is shown in Figure 6-6.

This project phase will occur over Years 6 through 20 of the regional ITS deployment and will be based upon an ongoing analysis of the need for freeway/incident management (based on safety and congestion) and opportunities for minimizing ITS implementation costs by coordinating with other planned construction projects.

1.1.4 Regional Cellular Hotline Incident Reporting System

This project consists of implementing a regional cellular hotline traffic reporting system which will allow en-route motorists with cellular phones to report traffic incidents and related information to a central coordinating facility. The coordinating facility will take the appropriate actions relative to involving law enforcement, emergency response and freeway/incident management control facilities. This system would be similar to the *999 cellular call-in service currently in-place in the Chicago area and to several similar systems operating successfully throughout the country.

There are a number of benefits to establishing a single, coordinated region wide traffic reporting service. First, designation of a single phone number makes it convenient for motorists. Second, by dedicating a special line for traffic reporting, the volume of 911 calls, which should only be related to emergencies, can be reduced. Finally, by routing all calls to a single facility, which is currently not the case even with 9 11 calls, traffic incidents can be dealt with in a coordinated, efficient manner.

The cellular hotline number would receive traffic data related to congestion, incidents, drunken drivers, malfunctioning traffic signals, downed signs, etc. The accuracy of motorist reports will be improved through the deployment of enhanced reference markers (project phase 1.1.9), supplemental roadway signs which may provide additional information to drivers (such as route and direction) and/or will be more closely spaced than current mile markers. In the future, the location of hotline reports may also be determined automatically using technology currently under development.

Special signage identifying the cellular hotline service will be deployed at a typical spacing of one sign per mile (two signs per centerline mile). Other physical components of the hotline system consist of the control center and associated computer and communications equipment. The costs for this project phase assume the sign spacing described above, an average installed cost of $100 per sign, a computer workstation ($10,000) and development of special software and a database for logging calls ($20,000).

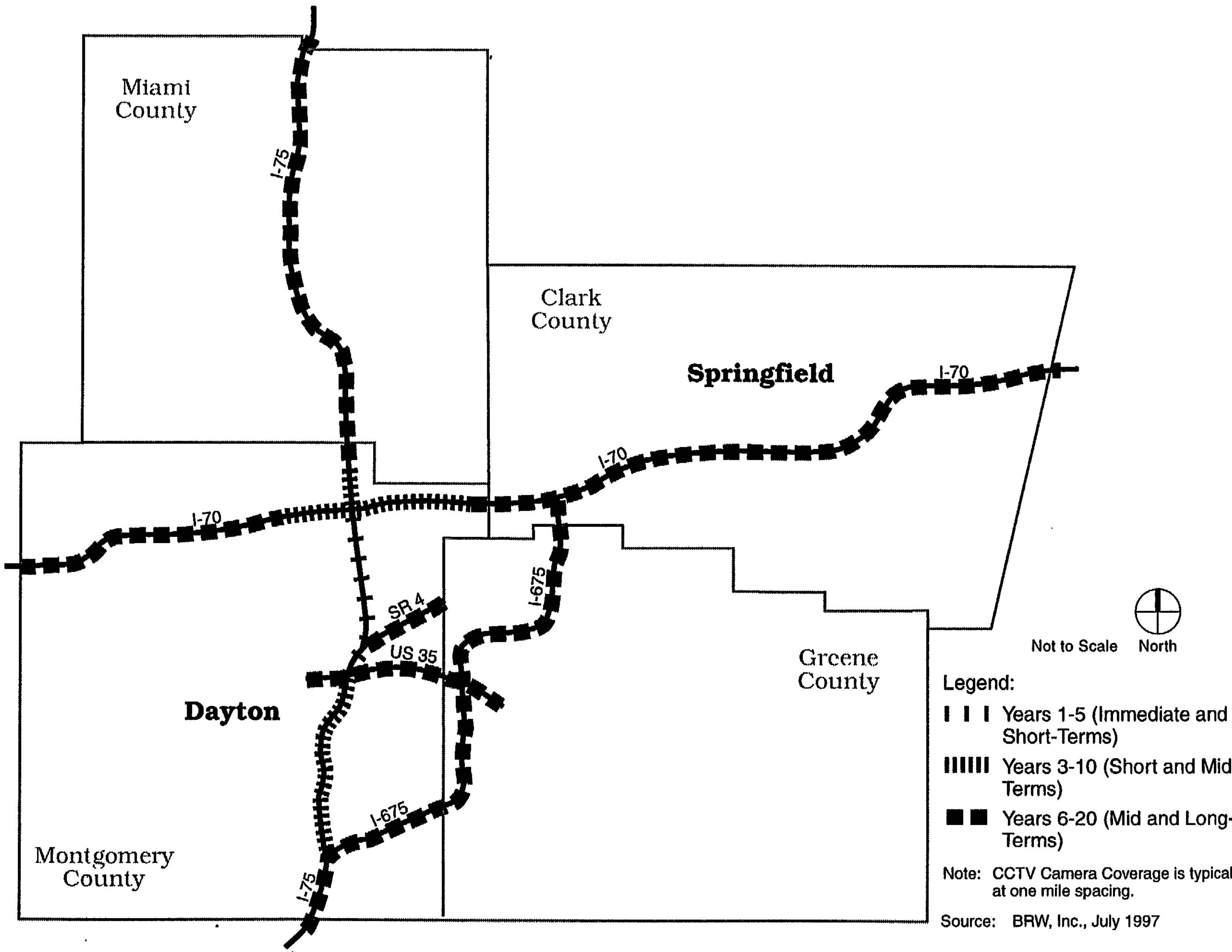
1.1.5 Phase I CCTV Camera System (I-75 from US 35 to I-70)

This project phase will install closed circuit television (CCTV) cameras at selected locations along I-75 between US 35 and I-70, a distance of approximately 8.5 miles. The recommended deployment phasing of the regional CCTV system, including project phases 1 .1.5 through 1.1.7, is shown in Figure 6-7.

The CCTV cameras will be used primarily for the visual verification of freeway conditions in response to reports of incidents (e.g., from service patrol operators, from law enforcement, from the regional cellular hotline service, etc.) but also will provide the ability to visually confirm freeway conditions at any time.

At a minimum, the cameras would be placed at all interchange locations, where added height would result in greater coverage, and known problem locations. The cameras will have the capability to pan, tilt and zoom and cover both directions of travel along a freeway segment. Camera operations will be controlled remotely from a freeway/incident management control facility (see Project 1.5) with access to CCTV footage (but not control capability) granted to selected remote workstations, including law enforcement, the media, operators of the regional traveler information system, etc.

A wide range of options relative to the display and utilization of CCTV information. Due to the inability of a human operator to effectively continuously monitor a large number of cameras, the trend is toward "exception based" strategies that automatically bring up a particular view based on detector or other data which indicates a potential incident. Typically, CCTV footage is monitored using a wall of television monitors with the camera operator having the ability to bring up any camera at any time.



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Freeway CCTV Camer
Proposed Implementation Phasir

Typically, CCTV cameras are mounted on separate, 40 to 50 foot poles within freeway right-of-way. The Appendix includes an illustration of a typical CCTV installation from the ARTIMUS ITS system in Cincinnati.

The cost analysis of this project phase assumes average spacing of one CCTV camera per mile (two cameras per centerline mile) and a cost of $50,000 per unit, including the local control and communications necessary to tie the camera into the backbone fiber optic communications system implemented along with vehicle detection in project phase 1.1.2.

1.1.6 Phase II CCTV Camera System (I-75 from I-675 to US 35 and from I-70 to US 40: I-70 from SR 48 to SR 201)

This project will implement CCTV camera coverage to the remainder of I-75 (from I-675 to US 35 and from I-70 to US 40) and to I-70 between SR 48 and SR 201, a total distance of approximately 10.5 miles. This project phase is recommended for phased deployment over Years 3 through 10 of the regional ITS deployment, based on an on-going analysis of the locations of reoccurring traffic problems (e.g., incidents and congestion) and the availability of funding. The recommended implementation phasing of the regional CCTV system, including project phases 1.1.5 through 1.1.7, is shown in Figure 6-7.

The basic communications infrastructure required to connect the cameras with central control facilities, the fiber optic backbone system, will be in place by the end of Year 5 as part of project phase 1.1.2 (detection system).

1.1.7 Phase III CCTV Camera System (Remainder of Freeway System)

This project will implement CCTV camera coverage to the remainder of the regional freeway system (as defined under the Current Conditions portion of this project description), a distance of approximately 110 miles.

This project phase will occur over Years 11 through 20 of the regional ITS deployment and based an on-going analysis of the locations of reoccurring traffic problems (e.g., incidents and congestion), the availability of funding and the implementation of the vehicle detection and fiber optic backbone communication systems (project phase 1.1.3), which will be implemented during this same period and which is required to connect the cameras with control facilities. The recommended implementation phasing of the regional CCTV system, including project phases 1.1.5 through 1.1.7, is shown in Figure 6-7.

1.1.8 Phase I Enhanced Reference Markers (I-75 from I-675 to US 40)

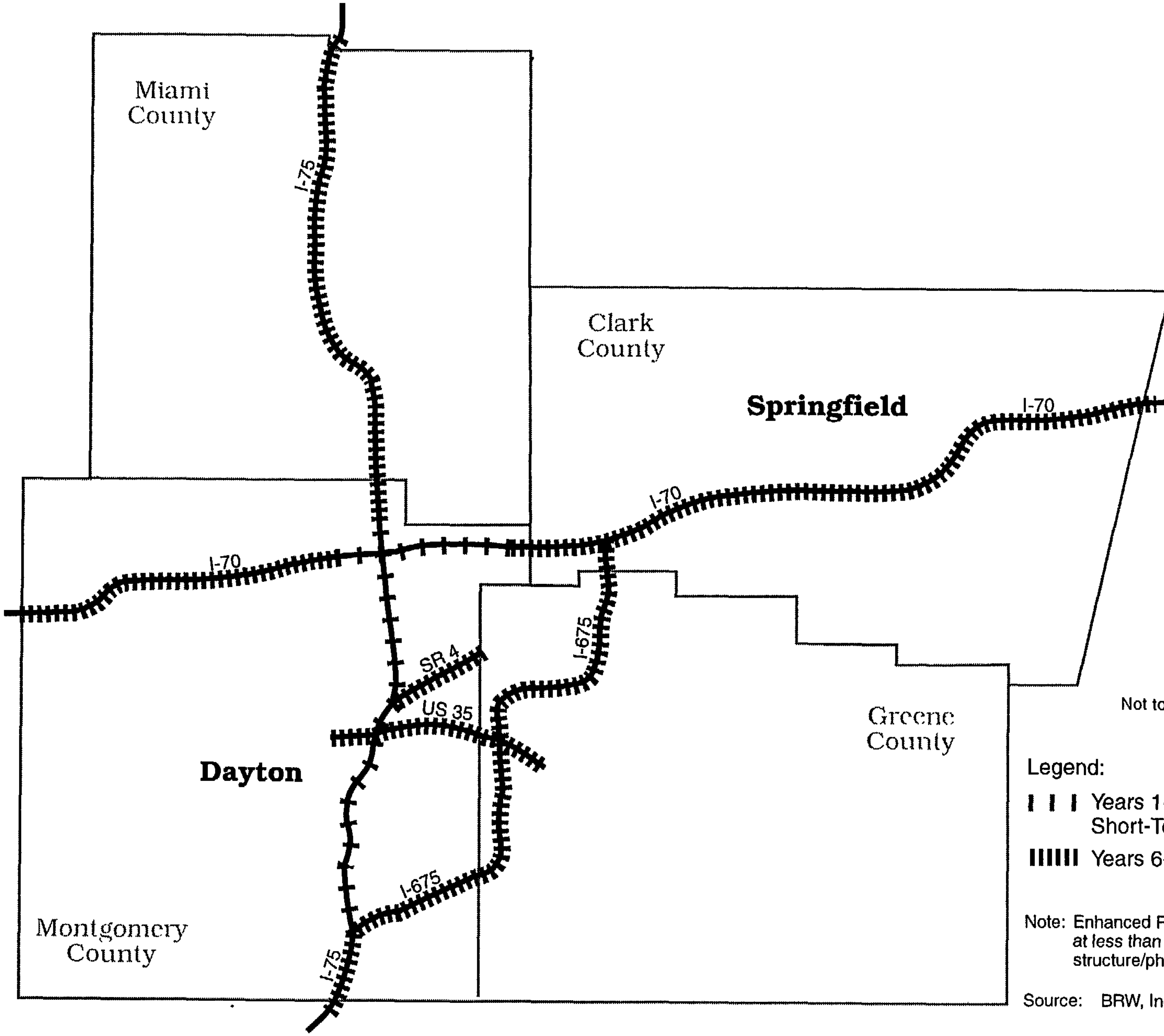
This project will implement enhanced reference signage along the approximately 20 mile segment of I-75 from I-675 to US 40. The recommended implementation phasing of the regional enhanced reference marker system, including project phases 1. I .8 and 1.1.9, is shown in Figure 6-8. The signage will provide more, and more accurate, location information to motorists, service patrol vehicles, law enforcement and others for use in locating traffic incidents such as accidents and break downs.

Obtaining accurate location information is currently a major problem, with many motorists unsure of their location, and even direction and route, when reporting emergencies. The signage implemented in this project will include, at a minimum, 2/10-mile location referencing (as opposed to the l-mile marker system currently in place) and may include additional information such as route and direction. The enhanced reference markers would be located along the side of the road and on major structures and physical features, such as overpasses, rivers, etc. An illustration of a typical enhanced reference marker from the ARTIMUS ITS system in Cincinnati is shown in the Appendix.

The cost analysis of this project assumes 2/10 mile sign spacing (10 signs per centerline mile) and an installed cost of $50 per sign.

1.1.9 Phase II Enhanced Reference Markers (Remainder of Freeway System)

This project will implement enhanced reference markers along the remainder of regional freeway system, a distance of approximately 120 centerline miles. This project phase is recommended for phased deployment over Years 6-10 of the regional ITS deployment based on the availability of funding and the identification of congestion/accident problem areas. The recommended implementation phasing of the regional enhanced reference marker system, including project phases 1.1.8 and 1.1.9, is shown in Figure 6-8.



Not to Scale North

Legend:

Years 1-5 (Immediate and Short-Terms)

Years 6-10 (Mid-Term)

Note: Enhanced Reference Marking typic at less than one mile spacing and a structure/physical feature locations

Source: BRW, Inc., July 1997

Figure

MIAMI VALLEY ITS EARLY DEPLOYMENT PLAN

MVRPC Miami Valley Regional Planning Commission

BRW, Inc.
Battelle
CH2M Hill
LJB
TEC

Freeway Enhanced Reference Markin
Proposed Implementation Phasin

Location: This project will eventually impact the entire freeway system of the four county Miami Valley area, defined for the purposes of the Strategic Deployment Plan as consisting of the following segments:

- I-70
- I-75
- I-675
- US 35 (from approximately James H. McGee Boulevard to westbound SR 835)
- SR 4 (from 1-75 to just north of SR 444)

The focus of the first five years of deployment will be on I-75 from US 40 to I-675 and I-70 from SR 48 to SR 201, the areas identified as having the greatest existing need based on analysis of existing and future traffic congestion, recent accident histories and roadway design. The project will be deployed throughout the remainder of the regional freeway system in Years 6 through 20 based on ongoing analyses of need, funding availability and opportunities to coordinate ITS deployment with other major planned construction.

Technology: This project will utilize a wide range of ITS technologies, including fiber optic communications, closed-circuit television, inductive loop or other (e.g., microwave/radar, acoustic, etc.) vehicle detection and two-way voice and data communications.

Administration: The local traffic jurisdictions responsible for the affected portions of freeway should administer the individual project phases which impact them. However, the regional ITS Deployment Committee and the various working groups identified in Section 9.0 of this report, should continuously coordinate and monitor deployment to promote integration, compatibility and efficiency. Whenever possible, it is recommended that multiple jurisdictions coordinate their efforts, especially during the design phase of the project when consideration of system wide issues will be most important. Coordination across jurisdictions is also recommended during equipment purchasing, both to promote compatibility and to increase buying power.

Time Frame: Projects 1.1.1, 1 .1.2, 1.1.5 and 1 1.8 can begin immediately. The design portions of these projects can be completed within 12 months. The highest priority segments of the freeway system, the approximately 28 miles along I-75 and I-70 identified in Figures 6.5 through 6.8 can be fully instrumented within the first 5 years of the regional ITS deployment. During Years 6 through 20, the detection system will be expanded to the remaining approximately 110 miles of the four-county freeway system.

PROJECT: **1.2 Traveler Information for Freeway Traffic Management**

Objective: This project provides the means to communicate traveler information, including information related to incidents, congestion, weather/pavement conditions, etc., to en-route freeway users. The information elements included in this project are distinguished from those discussed in Program Area 3, Multi-Modal Traveler Information System, because the components described in this project provide information only to freeway users and are located or operated primarily within the right-of-way of freeways.

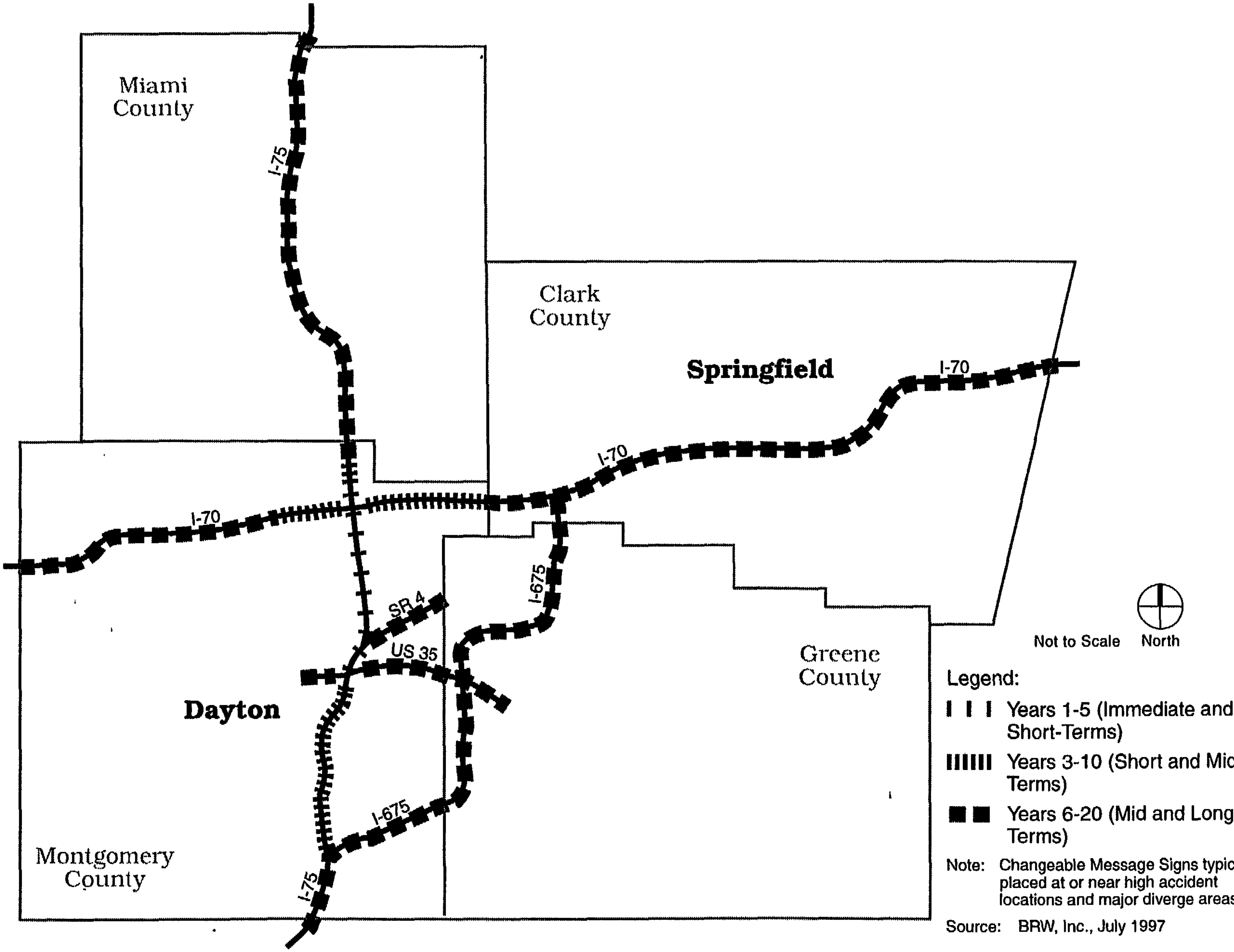
Current Conditions: With the exception of an Incident Management Plan for I-75 through the City of Dayton, the study area freeway system does not include any of the typical components of freeway management systems. There are no ramp meters, changeable message signs, highway advisory radio, vehicle detection stations, weather detection stations or enhanced signage for motorist reference. The Incident Management Plan includes a number of pre-defined detour routes and manually operated flip-down detour signs along I-75. The system is not frequently used, in part due to the time required to manually deploy the detour signs.

Freeway conditions are currently detected and reported via motorist reports, by media/private traffic reporting services and by law enforcement patrols. Private party reports are made primarily en-route via cellular phones to radio stations, private traffic reporting services or to law enforcement/emergency service agencies. Private traffic information sources, consisting of the media and Traffic Watch, Incorporated, a private provider of traffic information, gather their information from private party reports, coordination with/monitoring of law enforcement sources and through their own field units. Law enforcement information is gathered primarily through field patrols.

Freeway information is currently disseminated primarily via radio and television outlets, most of which coordinate to some degree with public information sources such as the Ohio Department of Transportation and law enforcement.

Scope: <u>1.2.1 Phase I Freeway CMS (I-75 from US 35 to I-70)</u>

This project implements electronic changeable message signs (CMS's) along I-75 from (and including) approximately US 35 to (and including) approximately I-70, a distance of approximately The signs will be utilized to provide freeway travelers with information about upcoming roadway



Figure

MIAMI VALLEY ITS EARLY DEPLOYMENT PLAN

MVRPC Miami Valley Regional Planning Commission

BRW, Inc.
Battelle
CH2M Hill
LJB
TEC

Freeway Changeable Message Sign
Proposed Implementation Phasin

conditions, including congestion, accidents, construction and weather/ pavement conditions. Figure 6-9 shows the recommended implementation phasing of the CMS system, including project phases 1.2.1 through 1.2.3.

In some cases, the information provided through the signs may prompt motorists to select alternate routes. In these cases, sign placement must allow sufficient time for this decision making. Changeable message signs are also appropriate for use in areas where, although alternate routes may be limited, it is beneficial to alert motorists in advance of upcoming roadway conditions.

Whenever possible, the CMS's will be mounted on existing bridge structures. When existing structures are not available, the signs will be mounted on their own separate structures. Typical spacing of CMS's when averaged over an entire freeway system is approximately one sign per every one centerline mile of freeway.

For this project phase, detailed field reviews will be necessary to determine appropriate locations due to different sign technologies, character height and line-of-sight issues. High potential locations include the 1-70/I-75 interchange, the 1-75/US 35 interchange, and the interchanges of I-75 with SR 4, SR 48 and SR 49.

Changeable message sign messages will be programmed and monitored via traffic control facilities (see Project 1.5). Messages will include planned and unplanned messages. Planned messages include information pertaining to planned events such as construction and special events. Unplanned messages pertain to dynamic traffic conditions, such as congestion and incidents.

Typically, a menu of messages is stored on computer and operators have the choice of selecting a message from the menu for a particular application. It is possible to utilize "expert system" software which can recommend a specific message, along with a range of other associated actions, based on the vehicle detection data. Such a system utilizes algorithms to associate certain patterns of detector data with roadway conditions, such as incidents. In addition to stored messages, operators will have the option of composing original messages for special purposes. In all cases, information on CMS's should pertain only to traffic conditions and should not be used for other purposes, such as tourist information, public service announcements, etc.

The physical components of a CMS system include the display itself, mounting hardware, a local controller cabinet and controller unit and local communications. Signs are available in a number of sizes utilizing a range of technologies, including flip disk, bulb matrix, LED and fiber optic. Although the selection of each specific sign and technology should be made during the design of the CMS system and should reflect site specific conditions, a large (e.g., 30’ x 12’) fiber optic type sign is recommended for most applications. *The Technologies Analysis Working Paper* (March 1997) completed as part of the Miami Valley ITS Strategic Deployment Plan process, discusses the relative strengths and weaknesses of alternative CMS technologies and should be consulted when selecting specific sign types. The Appendix includes a diagram showing a typical CMS installation.

Communication between the CMS’s and freeway/incident management control facilities will be via the fiber optic cable backbone to be implemented in conjunction with the vehicle detection system (project phase 1.1.2). As described in project phase 1.1.l, it is possible to decentralize the control responsibility for changeable message signs to fieeway service patrol vehicles. Doing so requires establishing a wireless communications capability between the service patrol vehicles and the signs and has not been assumed here.

The cost analysis of this project phase assumes an average spacing of one CMS every one centerline mile of freeway and an installed cost of $120,000 for large, fiber optic, “high end” CMS’s.

This project can begin immediately in Year 1 of the regional ITS deployment and will be completed by the end of Year 5.

1.2.2 Phase II Freeway CMS (I-75 from I-675 to US 35 and from I-70 to US 40: I-70 from SR 48 to SR 201)

This project will implement changeable message signs along I-75 from US 35 to I-675 and along I-70 from SR 48 to SR 201, a distance of approximately 18 centerline miles. The signs will be located at key decision points and identified traffic congestion/incident trouble spots, as determined during the system design. This project phase will be implemented in a phased manner over Years 3 through 10 of the regional ITS deployment. The fiber optic backbone communications infrastructure required to link the CMS’s to control facilities will be in place at the end of Year 5 in conjunction with project phase 1.1.2. Figure 6-9 shows the recommended phasing of the CMS system, including project phases 1.2.1 through 1.2.3.

1.2.3 Phase III Freeway CMS (Remainder of Freeway System)

This project will implement CMS's at key locations along the remainder of the regional freeway system (as defined under the Current Conditions portion of this project description), a distance of approximately 110 miles.

This project phase will occur over Years 11 through 20 of the regional ITS deployment and based an on-going analysis of the locations of reoccurring traffic problems (e.g., incidents and congestion), the availability of funding and the implementation of the vehicle detection and fiber optic backbone communication systems (project phase 1.1.3), which will be implemented during this same period and which is required to connect the CMS's with control facilities. The recommended implementation phasing of the regional CMS system, including project phases 1.2.1 through 1.2.3, is shown in Figure 6-9.

1.2.4 Highway Advisory Radio

This project will implement a regional highway advisory radio (HAR) system capable of providing en-route motorists with traffic congestion, incident, construction and detour information to allow drivers to consider diversion to alternative routes to avoid congested areas, to help reduce secondary accidents and to prepare drivers for construction conditions. Radio broadcasts may be limited to peak weekday demand periods and special events.

The HAR system broadcasts information on the AM radio band at low power and can be accessed by any motorist with an AM radio. The HAR system will consist of transmitter(s), a message recording and playback system and roadway signage to alert motorists to the availability of the information.

The HAR system assumed here consists of a single region wide radio station that transmits the same message to all receivers within the region. As such, the system is best operated by a single authority, in close coordination with local jurisdiction freeway/incident management control facilities. Since no single region wide freeway/incident management control center is proposed (see Project 1.5), the logical operator of the HAR system will be the same authority who will operate the Central Data Server of the Multimodal Traveler Information System. As described in Program Area 4, this authority may be a public or private entity.

Regardless of the ownership and operating arrangement selected, it may be possible to avoid the requirement to acquire a separate FCC frequency license for the HAR system by partnering with an existing broadcaster.

This approach has been used successfully in Minneapolis, Minnesota where the Department of Transportation partnered with a jazz music station.

The cost estimate for this project phase is based on experience with the ARTIMUS ITS system in Cincinnati and includes a two frequency region wide system and roadway signage. The Appendix of this report includes an illustration of the type of signage typically used in conjunction with regional HAR systems.

1.2.5 Major Genertor/Localized ATIS Study

This project will implement two studies, each identifying locations for implementation of permanent localized advanced traveler information systems (ATIS's). Locations not requiring permanent infrastructure, such as may be the case with certain event facilities, will be addressed through project phase 1.4.1, which implements portable traffic management systems (PTMS's) for construction and special events.

Candidate locations for permanent localized ATIS's include major traffic generators such as shopping malls, sporting venues, and arts and entertainment facilities. The ATIS's identified in this study may be similar to the system currently under development for the Wright State University Nutter Center/Wright Patterson Air Force Base/Fairfield Mall area. Typical features of localized ATIS's include real-time, dynamic parking availability information and route guidance for inbound motorists and real-time traffic congestion, route and transit availability information for outbound travelers.

Localized ATIS' supplement the region wide traveler information system (see Program Area 4) by providing more specific, local information pertaining to a particular facility and/or event. Typical components of local ATIS include many of the same technologies used for regional ATIS's, such as vehicle detection, changeable message signs, CCTV cameras, video displays/monitors and local (low power), as opposed to region wide, highway advisory radio. Key issues to be identified in the conceptual and subsequent detailed design of the localized ATIS's are coordination/connection with the regional multi-modal traveler information system, with local freeway/incident management facilities and integration of localized ATIS's into incident management plans.

The first of the two studies performed under this project phase will occur immediately in Year 1 of the ITS deployment and will identify and prioritize specific local ATIS deployments and will produce the conceptual design of the recommended system at each of the two highest priority locations. Project phase 1.2.5 will implement these two highest priority

ATIS's The second study to be performed under this project phase will occur after the first two localized ATIS's have been implemented and after operating experience has been gained. The second study will reexamine the need for additional ATIS deployments and recommend the two highest priority locations for implementation in project phase 1.2.6. If required, this cycle of study and implementation of localized ATIS's could be extended into the future.

1.2.6 Major Generator/Localized ATIS Implementation

This project produces the detailed designs and implements the Localized ATIS's identified in project phase 1.2.5. The first two ATIS's will be implemented in Years 2 and 4, respectively. The second study and implementation of the second set of ATIS's will occur during Years 6 through 10 of the regional ITS deployment. As noted in project phase 1.2.5 above, this study/implementation cycle could be extended beyond Year 10 if warranted.

Location: The CMS and HAR systems will cover the entire freeway system of the Miami Valley, as defined for the purposes of the Strategic Deployment Plan as consisting of the following segments:

- I-70
- I-75
- I-675
- US 35 (from approximately James H. McGee Boulevard to westbound SR 835)
- SR 4 (from I-75 to just north of SR 444)

The CMS system will be deployed in a phased manner, with the focus of the first five years of deployment being on I-75 from US 35 to I-70, the area identified as having the greatest existing need based on analysis of existing and future traffic congestion, recent accident histories and roadway design. In Years 3 through 10, CMS coverage will be expanded along I-75 to I-675 and along I-70 from SR 48 to SR 201. In years 11 through 20, the CMS system will expand to the remainder of the regional freeway system based on ongoing analyses of need, funding availability and opportunities to coordinate ITS deployment with other major planned construction.

The HAR system will be deployed regionally. The localized -ATIS's will be implemented at four specific major traffic generator locations over a period of ten years.

Technology: This project utilizes fiber optic cable, fiber optic type changeable message signs, highway advisory radio and potentially a wide range of local advanced traveler information system components (e.g., vehicle detection, CCTV cameras, video displays, etc.).

Administration: The local trafftc jurisdictions responsible for the affected portions of freeway should administer the individual CMS deployments which impact them. However, the regional ITS Deployment Committee and the various working groups identified in Section 9.0 of this report, should continuously coordinate and monitor deployment to promote integration, compatibility and efficiency. Whenever possible, it is recommended that multiple jurisdictions coordinate their efforts, especially during the design phase of the CMS projects when consideration of system wide issues will be most important. Coordination across jurisdictions is also recommended during equipment purchasing, both to promote compatibility and to increase buying power.

Development of the regional HAR system should be administered by the Miami Valley Regional Planning Commission and should be coordinated closely with the development of the Multimodal Traveler information System. The MVRPC should also administer both the study and' implementation phases of the Major Generator/Localized ATIS project phases. Utilization of consultants is assumed for portions of all project phases.

Time Frame: Project 1.2.1 can begin immediately, with the design of the system complete by the end of Year 1 and implementation phased over Years 2 through 5. CMS deployment will be expanded over Years 3-10 to cover the remaining high priority locations along I-75 and along I-70 between SR 48 and SR 201, a distance of approximately 18 centerline miles. Over Years 11 through 20, the CMS system will be expanded to the remainder of the freeway system, a total distance of approximately 110 centerline miles. The timing of the expansion of the CMS system should reflect the ongoing identification of congestion/incident trouble spots, the deployment of the fiber optic backbone communications infrastructure (through project phases 1.1.2 and 1 .1 .3) and opportunities to coordinate with other planned construction.

Plans and specifications for the HAR system can be developed starting in Year 4 and can be completed within eight months. Deployment of the HAR system can be completed by the end of Year 5.

The Major Generator/Localized ATIS study can be completed by the end of Year 1. A second study should occur sometime in Years 6 through 10. The first two ATIS's can be deployed in Years 2 and 4, respectively, with the second set of ATIS's deployed sometime during Years 6 through 10.

PROJECT: **1.3 - Traffic Control**

Objective: The objective of this project is to provide the means to regulate the volume and rate of vehicles entering the freeway system. Regulation of freeway on-ramp traffic flows serves several critical purposes and is considered to provide much of the overall benefit traditionally ascribed to freeway traffic management.

Current Conditions: Current freeway traffic control strategies are essentially limited to those associated with construction traffic control, such as lane closures using cones and barrels. The operators of the regional freeway system have no mechanism for directly and dynamically regulating the access to the freeway system in response to changing traffic conditions.

Scope: 1.3.1 Ramp Meter Study

This project will examine the need and feasibility of freeway on-ramp metering throughout the Miami Valley. Any **specific** locations where ramp metering is found to be desirable will be identified and prioritized for implementation.

Ramp meters are traditional red, yellow, green traffic signals located on freeway on-ramps. By allowing vehicles to accelerate onto the freeway only during the green phase, the flow rate of traffic onto the freeway can be regulated. This capability provides two very important benefits: entering vehicle platoons are broken up into smaller units that can be safely absorbed, and the total number of entering vehicles within a specified period can be held to a level which avoids extreme downstream congestion and which maintains efficient travel speeds. The ability to meter the rate of on-merging freeway traffic is especially important during incidents.

Traffic impacted by ramp meters is either temporarily stored on the on-ramp or voluntary detours around the ramp by selecting an alternate route. In practice, it has been found that no more than 5 to 10 percent of traffic is diverted. By carefully balancing the use of available ramp space between acceleration and storage, and the use of timing schemes that are sensitive to upstream arterial street traffic signal operations, ramp meters can successfully be retrofitted on many existing ramps without major construction and without serious negative impacts to adjacent streets.

Ramp meters have been shown to have dramatic benefits, both in terms of reducing accidents and improving traffic flow. “In practice, metering shortens the duration of congestion and improves overall traffic conditions. There is strong evidence that metering increases throughput, as many metered highways sustain volumes well in excess of 2,100 vehicles per hour (flows up to 2,450 vehicles per hour have been achieved). By eliminating the erratic stop-and-go behavior associated with congestion, metering can also result in up to 50 percent increases in speed and up to a 30 percent reduction in accidents." (University of California Berkeley PATH Program, 1997).

Theoretical and empirical results indicate that the metering strategy and control algorithm can dramatically effect the level of benefits achieved. Metering rates typically range between four and twenty seconds. These limits are grounded in practical experience. There are a number of alternative ramp metering control strategies and algorithms available, ranging from simple pre-timed operation to highly advanced, traffic responsive approaches which feature centralized control. Pre-timed operation can provide benefits and is always an option. Sophisticated systems can dramatically assist in the reduction of adverse impacts to adjacent streets by flushing ramp meter queues when they threaten to spill-over into intersections.

The initial focus of the ramp metering study will be on the portion of I-75 where immediate deployment of a freeway/incident management system is recommended (between I-70 and US 35).

The effectiveness of ramp metering, like any other traffic regulation, is largely dependent upon voluntary driver compliance. Therefore, advance publicity should be positive and plentiful in order to keep violation rates low. Police enforcement of the meters should also occur periodically, especially during the initial implementation period.

Ramp meters can operate without constructing specialized bus and high occupancy vehicle (HOV) bypass lanes. However, bypasses are highly desirable features that encourage transit and carpooling usage and should be considered where adequate right-of-way is available and installation costs are low.

The effectiveness of ramp metering is significantly enhanced when ramp meters are coordinated with adjacent arterial street traffic signals. The need, opportunity and feasibility of integration with arterial street traffic signal systems will be one of the factors considered in the regional ramp metering feasibility study.

Although they represent a potentially powerful tool for traffic management, ramp meters do not "solve" all safety and capacity problems. In addition, depending upon the specific application, ramp meters can have pitfalls, including:

- Equity Concerns (e.g., suburban travelers who do not have to wait to get on the freeeway when heading inbound to the city but who travel through portions of the city where ramps are metered)

- Political Resistance (e.g., in response to complaints from citizens, etc.)

- Public Acceptance/Compliance

- Availability of Diversion Routes

When deployment is based upon a thorough and sound assessment of the specific need for, feasibility of and operating strategy for ramp meters in specific locations, and when deployment is accompanied by an aggressive education and outreach effort, these disadvantages can be managed and the potential of ramp metering can be captured. The ramp metering feasibility study will help avoid these pitfalls.

1.3.2 Ramp Meter Implementation

This project designs and implements ramp meters at the locations where they are found to be needed and feasible in the study conducted in project phase 1.3.1. The initial focus of the ramp metering study will be on the portion of I-75 where immediate deployment of a freeway/incident management system is recommended (between I-70 and US 35) and it is expected that any ramp meter implementation will begin in this area. Ramp meters should be integrated with arterial street traffic signals wherever possible and ramp metering implementation in the I-75 corridor in particular should be coordinated with project phase 2.2.2, which implements diversionary traffic signal plans along routes paralleling I-75.

Location: Project phase 1.3.1 will consider all freeway on-ramps in the four-county Miami Valley study area. Based on the analysis of freeway conditions performed for the Strategic Deployment Plan, the section of I-75 between I-70 and US 35 has been identified as the area most in need of ramp metering and it is assumed that these findings will be supported by project phase 1.3.1 and that any ramp metering deployment would begin in this area.

Technology: Ramp meters utilize vehicle detection, local and system communications and traffic signal technology. The vehicle detection deployed in project phases 1.1.2 and 1.1.3 could be configured to provide the detection required for ramp metering. Otherwise, this detection will be supplemented as necessary as ramp meters are deployed.

Administration: The Miami Valley Regional Planning Commission will administer the ramp metering study. If pursued, ramp meter deployment should be administered by the local traffic jurisdictions responsible for the affected portions of the freeway system.

Like all of the elements of the freeway/incident management system, operation of ramp meters is recommended to be decentralized, with each local jurisdiction responsible for operating the ramps within their boundaries. This approach maintains local control and is consistent with the stated preferences of the committees which helped develop the Strategic Deployment Plan. However, it sacrifices a great deal in terms of the ability to truly manage freeway operations on a system level and generates a great need for coordination and cooperation among local freeway/incident management system operators.

The ramp meters implemented in this project, although operated by local jurisdictions, should be utilized within the context of a region wide strategy for freeway traffic management and in a coordinated fashion with an emphasis on system performance. The ITS Deployment Committee, and specifically the Freeway/Incident Management Work Group described in Section 9.0 of this report, will lead the development of such a regional strategy and provide the structure for coordination and cooperation.

Time Frame: Project 1.3.1 can begin immediately in Year 1 and can be completed within six months. Per the direction of the committees which developed this Strategic Deployment Plan, ramp meter deployment has been postponed until sometime after Year 5 of the regional ITS deployment. However, if found to be needed and feasible, moving up deployment of ramp meters should be strongly considered.

PROJECT: **1.4 - Enhanced Incident Management Program**

Objective: This project develops portable traffic management systems (PTMS's) for use in temporary traffic control situations on freeways, such as construction zones and special events which are not addressed through the permanent traveler information systems described in project phase 1.2.6 and 1.2.7. The PTMS concept is intended to provide a means to control periodic traffic congestion problems resulting from major events where the traffic problems are not frequent enough to justify major upgrading of facilities, such as installation of permanent traveler information/traffic control features.

The PTMS would consist of a self-contained system, comprised of several components to be transported and deployed via small trailers. The PTMS will provide en-route motorists with real-time construction, congestion, incident and detour information. The PTMS concept has been proven successful in construction work zone applications in a recent Federal ITS Operational Test in the Minneapolis-St. Paul, Minnesota area. Reported benefits include significant increases in traffic volumes through the work zone, a significant decrease in traffic diverting away from the work zone (which was attributed to increased driver confidence in getting through the work zone), a reduction in the variability in the speed of vehicles traveling within the work zone and a reduction in the speed of vehicles entering the work zone.

The PTMS would include portable HAR and CMS equipment, a detection system, video cameras and will require a wireless communications link with a field or permanent control facility, such as a local freeway/incident management control facility or an existing traffic signal control room.

The system would be initiated by a portable or permanent CMS location upstream of the construction or special event zone that would inform the approaching motorist of the incident and the appropriate radio frequency for traffic information. Incidents and congestion will be detected through the detection system and/or the video cameras, which may be one component if machine vision detection is used. The portable CMS's would be placed at critical points along the desired travel path to instruct en-route motorists of appropriate paths. This information would be supplemented with HAR information, which may be broadcast locally within a limited area such that motorists would receive sequential instructions from various portable HAR locations as they progress through the freeway segment.

1.4.2 Regional Incident Management Task Force and Memorandum of Understanding

This project consists of a six-month Regional Incident Management Task Force effort. The task force effort will culminate in a regional incident management memorandum of understanding committing the task force members to the development of a regional incident management plan and to its implementation, as well as an outline of the issues and areas to be addressed in the regional plan. The objective of the task force effort will be to reach consensus on how the existing incident management process can be improved through coordination with, and utilization of, the regional ITS system which will be deployed in the coming years.

The task force will include representatives of all agencies with major roles and responsibilities in incident management, including state, county and local law enforcement; state, county and local traffic engineers; fire departments; ambulance services, etc. The task force will meet twice a month over the six month effort.

The Regional Incident Management Memorandum of Understanding will be a joint statement of support for improved incident management systems and operations. The memorandum will be a statement of policy, with specific roles and responsibilities to be identified in the subsequent Regional Incident Management Program Plan. The memorandum will provide a statement of goals and objectives in support of a cooperative policy.

The memorandum should be signed by policy makers of the affected jurisdictions, in addition to the actual members of the task force. This document will serve to inform the public of intent and commitment to the system, and will provide general guidance (through goals, objectives, and policies) for further system development.

To best serve its intended purpose, execution of the memorandum of understanding should be well publicized. This should include. formal signing ceremonies by city and state officials and broad media coverage. In addition to indicating support and cooperation of involved jurisdictions, this will provide an early opportunity for public education regarding the character and intent of the ITS enhanced incident management system.

1.4.3 Regional Incident Management Program Plan

This project develops a Regional Incident Management Program Plan based on the understanding established through the task force effort in project phase 1.4.2. The Program Plan produced in this project will consider the freeway incident management issues of the entire four county Miami Valley Study area and will focus on identifying actions which will employ the freeway management in&structure deployed in Projects 1.1, 1.2, 1.3 and 1.5 in the management of incidents.

The Regional Incident Management Program Plan should consider the following types of issues:

- agency roles and responsibilities
- communications
- the components of incident management:
  - identification & verification
  - response
  - clearance
- incident management system design, construction, maintenance and Operations
- diversionary routes and integration with arterial street operations
- specialized control plans

1.4.4 I-75 Incident Management Operational Plan

Drawing upon the Regional Incident Management Program Plan produced in project phase 1.4.3, this project will produce a detailed operational plan for incident management along the I-75 Corridor from I-675 through the I-70 interchange. Figure 6-10 shows the recommended deployment phasing of incident management programs in the Miami Valley.

The I-75 Incident Management Operational Plan will be much more detailed than the Program Plan, which will generally have a more policy orientation. The Operational Plan will include development of specific diversionary traffic plans and procedures and will require extensive interaction with traffic engineers on issues related to arterial street utilization during incidents. The plan will be accompanied by complete cost and staffing estimates and will include any required design drawings.

1.4.5 I-75 Incident Management System

This project implements the I-75 Corridor Incident Management Operational Plan developed in project phase 1.4.4.

1.4.6 Regional Incident Management System

This project consists of developing operational plans similar to the I-75 Corridor Incident Management Operational Plan for other freeway segments in the four county Miami VaIley study area. Interstate I-70 through Clark County is recommended as the location for the first plan. Figure 6-10 shows the recommended deployment phasing of incident management programs in the Miami Valley.

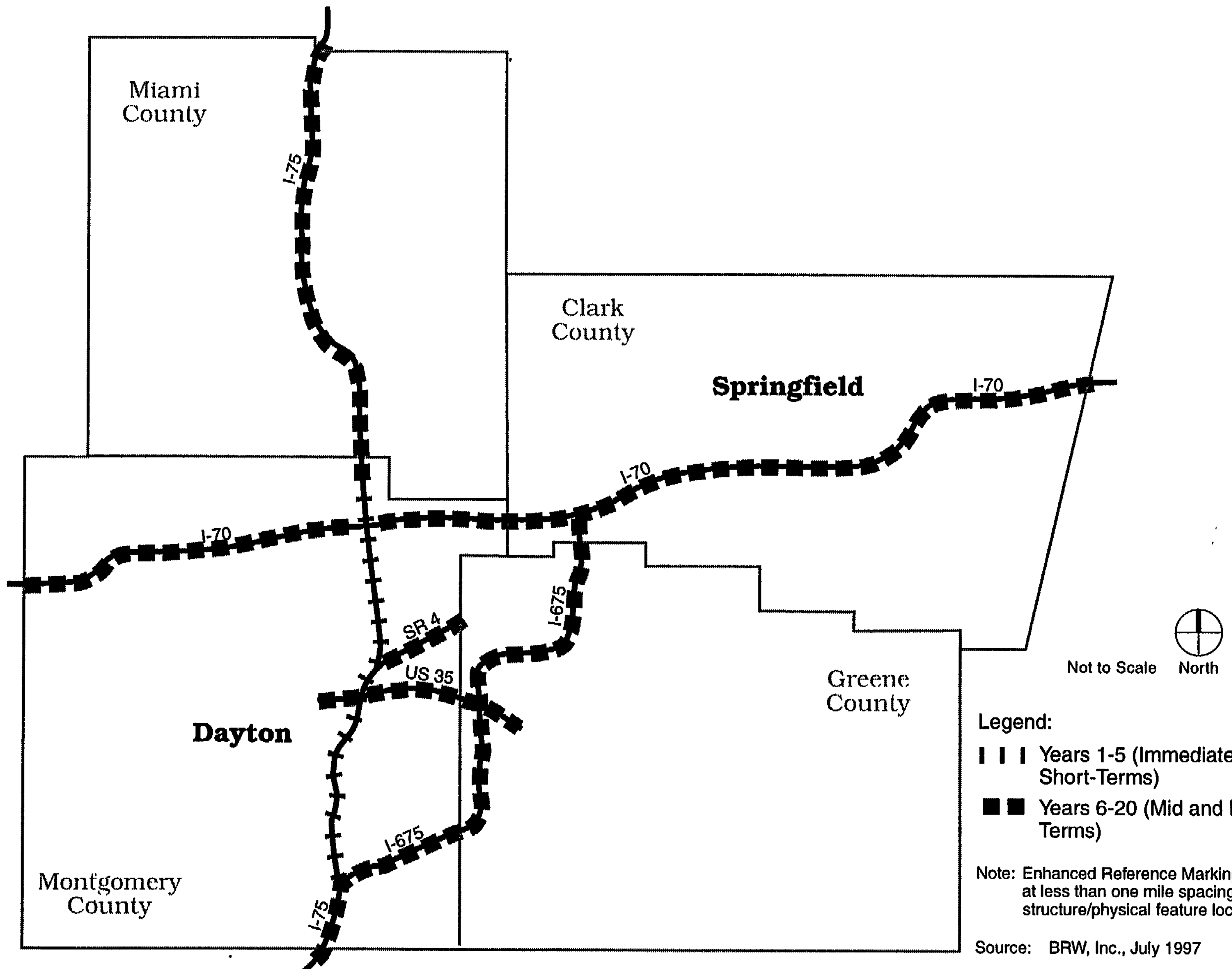
The level of detail of the operational plans for the other regional freeway segments will vary considerably based on a number of factors, including the number and severity of incidents which occur on the affected roadways, the impact of incidents on freeway operations, the number of participants in the incident management process and the extent of deployment of freeway/incident management infrastructure (e.g., changeable message signs, ramp meters, etc.). Development of the operational plans will be phased over time based on these and other factors.

In areas where there are relatively few incidents and little freeway management infrastructure, the operational plan may be little more than a specific agreement to apply the regional incident management policies identified in the Regional Incident Management Program Plan developed in project phase 1.4.3.

Location: Project 1.4.1 can be applied in construction work zones and in the vicinity of special events throughout the four county Miami Valley area. The incident management task force and program plan project phases (1.4.2 and 1.4.3) will consider the entire regional freeway system, although the plan may focus on those areas with the greatest existing incident management needs. Project phase 1.4.5 will focus on the I-75 Corridor from I-675 through the I-70 interchange.

Technology: Project 1.4.1 will utilize non-intrusive vehicle detection, portable changeable message signs, highway advisory radio and wireless communications technologies. The incident management project phases (1.4.2 through 1.4.3) will develop incident management procedures which will incorporate use of a wide range of ITS technologies, including vehicle detection, changeable message signs, highway advisory radio, ramp metering, closed-circuit television and fiber optic communications.

Administration: The Ohio Department of Transportation will administer the development and implementation of the PTMS systems (project phase 1.4.1), with participation by interested local jurisdictions. The Miami Valley Regional Planning Commission will administer the incident management project phases 1.4.2 through 1.4.5, with the Clark County-Springfield Transportation Coordinating Committee having responsibility for the portions of Phase 1.4.6 within Clark County.



Legend:

Years 1-5 (Immediate and Short-Terms)

Years 6-20 (Mid and Long-Terms)

Note: Enhanced Reference Marking typic at less than one mile spacing and a structure/physical feature locations

Source: BRW, Inc., July 1997

Figure 6

MIAMI VALLEY ITS EARLY DEPLOYMENT PLAN

MVRPC Miami Valley Regional Planning Commission

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Incident Management Program Proposed Implementation Phasin

Time Frame: The design and procurement of the PTMS (project phase 1.4.1) can begin immediately in Year 1 and can be deployed by the end of Year 1. The Regional Incident Management Task Force effort (1.4.2) should begin immediately in Year 1 with the Memorandum of Understanding executed within six months. Development of the Regional Incident Management Program Plan (1.4.3) should begin near the end of the task force effort (in approximately months 4 -5 of Year 1) and can be completed by the end of Year 1. Development of the I-75 Incident Management Operational Plan (1.4.4) can begin in the beginning of Year 2 and can be completed within eight months. Deployment of the plan (1.45) can begin by the end of Year 2. Development and implementation of operational plans for other portions of the regional freeway system can be phased based on need and-resource availability over Years 2 through 5, with the Clark County/I-70 Corridor recommended as the first plan location.

PROJECT: **1.5 - Traffic Management Facilities**

Objective: The purpose of this project is to implement the facilities and capabilities necessary to perform the sorts of freeway management/incident management monitoring, control and coordination functions which are best performed from a fixed location, or for which the ability to perform these functions from a fixed location is desirable. Examples of these types of functions include visual monitoring of CCTV output and control of CCTV cameras, monitoring and control of changeable message sign messages, monitoring and control of highway advisory radio messages, monitoring and control of ramp meters, and coordination of incident management.

For a number of reasons, an overall *decentralized* approach to freeway/incident management system control is recommended. This approach does not include a single region-wide traffic management center, although such a consolidation of local facilities would be possible. A decentralized approach is recommended based on the following factors:

- Flexibility - Separate facilities can be aggregated, physically and/or electronically, whereas development of a central facility often requires a rather large, up-front capital investment and it can be difficult to decentralize operations once a single central facility is created.

- Local Preference - the local agency representatives which have been instrumental in the development of the Strategic Deployment Plan have consistently expressed scepticism regarding the appropriateness of a single, central regional traffic management center.

- Home Rule - in the State of Ohio, local jurisdictions are responsible for the Interstate and State highways located within their limits. In areas where these facilities are operated by state departments of transportation, the state DOT is the logical choice for the controller of the regional freeway management system.

Of course, there are potential disadvantages to decentralization of freeway/incident management functions: necessary hardware, software and skills may be duplicated unnecessarily, coordination and cooperation can at times be hampered by the lack of face to face contact and the regional freeway/incident management program may an identity.

The proposed approach for freeway/incident management control initially recommends a limited number of separate, locally operated control facilities, which may be nothing more than a specially equipped cubicle or room on an existing property. The number of facilities should be limited to the jurisdictions involved in the initial phase of freeway/incident management along I-75 from US 40 to US 35 and along I-70 from SR 48 to SR 20 1. These facilities should become operational in Years 2 and 3, coincident to the operation of the various freeway management system elements (CCTV, CMS, etc.) and the deployment of a coordinated incident management system for I-75.

As the freeway management system expands in Years 3 through 5, consideration should be given to the location of “permanent” control locations and the possibility of aggregating some or all of the facilities into a central location. Based on the operating experience to date, individual jurisdictions will decide whether they wish to maintain their own control facility or whether they wish to combine with other jurisdiction(s). By Year 6, a long-term, “permanent” strategy to freeway management system control should be identified and put into place.

It should be stressed that it may never be deemed necessary or advantageous to consolidate all regional freeway/incident management control functions into a single facility. With proper coordination, geographic subcomponents of the system can be controlled from separate control facilities. If consolidation of control functions does occur, ODOT, the City of Dayton and the MVRPC would represent the logical operators of control facilities. The MVRPC or ODOT would represent logical choices for an operator for some of the smaller jurisdictions. A precedent for this sort of arrangement has been made with the MVRPC’s current operation of the Salem Mall traffic signal system.

Regardless of whether a single central facility or consolidation to a limited number of “subregional” facilities is ever deemed appropriate, it is expected that a variety of organizations will be connected to, at various levels, the freeway management control facilities. The amount of control/access given to these remote workstations can be varied. If the MVRPC or ODOT was selected by some of the smaller jurisdictions to perform control functions, these jurisdictions could still have access to data via remote work stations.

As discussed in project phase 1.1.1, many control functions can be further decentralized by providing service patrol vehicles the means to change changeable message signs and perform other functions from the field. Due to technological constraints and obvious safety concerns, service patrol drivers are not able to monitor CCTV output while on patrol. This project, like phase 1.1.1, assumes that service patrols would be granted few, if any, control functions and that these functions would be performed at a fixed facility.

As is discussed further below, information from the traffic management facilities will be feed to a central traveler information data base for processing and subsequent distribution via a number of outlets. As discussed in Program Area 3, the ATIS Central Data Server should be located in a single physical location. Although a central location will minimize the cost of hardwire (fiber optic, etc.) connections, the Central Data Server can be located anywhere within, or beyond the region.

It should be noted that although the technology for integrating a central data server with many sources of, and outlets for, traveler information is entirely feasible, such an integrated scheme requires significant institutional cooperation and coordination. The development of procedures and agreements relative to a central regional source of traveler information should be pursued as vigorously as the infrastructure components of such a system.

Current Conditions:

With the exception of an Incident Management Plan for I-75 through the City of Dayton, the study area freeway system does not include any of the typical components of freeway management systems, including control facilities. The interaction which occurs between law enforcement, traffic/public works, emergency response agencies, towing and media/commercial traffic reporting organizations is generally highly decentralized and utilizes traditional technologies such as telephone, fax and two-way radio.

The Cities of Moraine and Kettering are currently in the process of deploying a project that will include shared use of arterial street CCTV camera footage. The CCTV cameras will be operated via existing traffic signal control facilities.

Scope:

1.5.1 Interim Control Facilities Design

This project develops the specific design and specifications for the freeway/incident management facilities to be utilized during the first 5 years of the freeway management system deployment. This conceptual planning would include analysis and evaluation of alternative locations, staffing needs, operating hours, components, procedures, size requirements and communications.

1.5.2 Interim Control Facilities Implementation

This project implements the facilities and procedures identified in project phase 1.5.1.

1.5.3 Permanent Control Facilities Design

This project phase consists of an assessment of the need to alter the arrangements for freeway/incident management system control followed during the first 5 years of deployment. By Year 5, considerable operating experience will have been accrued and participating agencies will be in an informed position to judge the long-term or “permanent” needs for freeway/incident management system control. The outcome of this study will be a conceptual design and phasing plan for deployment of the long-term control solution, which could include incremental expansion of multiple decentralized facilities or some degree of consolidation of control functions.

1.5.4 Permanent Control Facilities Implementation

This project will implement the recommendations of project phase 1.5.3 and could include the addition of staff and/or equipment to existing facilities, construction/dedication of new facilities and under either scenario, could entail some degree of aggregation of control functions across jurisdictions.

Location: The interim control facilities are recommended to be located in conjunction with the traffic signal/traffic engineering facilities of the agencies which border the portion of I-75 scheduled for immediate freeway/incident management system deployment (US 40 to US 35). The affected jurisdictions include Montgomery County, City of Dayton and City of Vandalia. Following an analysis of long-term control needs and siting considerations, ‘permanent” locations will be established. These locations may be the same as the interim locations or may reflect some geographic aggregation of control functions across jurisdictions. At a minimum, some of the “permanent” locations will be new in that they will involve jurisdictions which will not have freeway/incident management infrastructure until after Year 5.

Technology: The technology utilized at the traffic management facilities will include standard office equipment as well as computer servers dedicated to specific functions, such as processing detector data and flagging data profiles indicative of incident conditions; monitors for the display of CCTV data, computer work stations for entering CMS and HAR messages; and two-way radio for coordinating with service patrol units, law enforcement and other organizations. As discussed in Section 5.0 of this report, specific communication technologies will vary depending upon the type and frequency of data transmission and may be any of three standard “communication profiles”. Dense data which must be communicated very frequently, such as vehicle detector data, will be transmitted to traffic management facilities via fiber optic cable.

Administration: This project should be administered by the participating local jurisdictions under the coordination of the regional ITS Deployment Committee and the Freeway/Incident Management Work Croup (see Section 9.0 of this report). During the early portions of project phase 1.5.1, the Deployment Committee should play a strong role in insuring that the benefits and requirements for shared control facilities are fully considered and insuring that if in fact a completely decentralized system of local control centers is pursued, that the necessary linkages between control centers are designed into the facilities.

Time Frame: Project phase 1.5.1 can begin immediately and should be completed in conjunction with the design of the freeway management system (e.g., project phase 1.1.2, 1.1.5, etc.). This project phase can be accomplished within eight months. Project 1.5.2 can begin in Year 2 and should track along with the project phases which will deploy the initial freeway/incident management system. Project 1.5.3 should begin after a few years of freeway/incident management system operating experience, approximately in Year 5, although this project can be moved up or back depending on whether it is determined that enough operating experience has been realized to allow a decision on the long-term strategies for freeway management control. Project 1.5.3 can be accomplished within eight months. Project 1.5.4 can begin immediately following Project 1.5.3.

PROGRAM AREA: 2 - ADVANCED TRAFFIC SIGNAL CONTROL SYSTEMS

DESCRIPTION:

This program area provides support to, and extends the existing efforts in the Miami Valley to implement advanced traffic signal control systems to improve the flow of traffic in major regional corridors. Through the coordination of signal control systems on arterials and their integration with traffic management systems on adjacent freeways, traffic can be efficiently controlled for incidents and special events that cause non-recurring congestion.

By upgrading and expanding the signal systems in major regional corridors, general traffic flow for all modes can be improved through efficient and responsive timing plans. Transit and emergency vehicle service can also be improved through the use of signal priority capabilities in the integrated system. Railroad grade crossing safety can be improved and the detrimental impact of tram crossings on signal operations can be mitigated through advanced signal system improvements.

Elements of the ultimate system could include:

- Traffic Responsive Signal Operations
- An Interagency Coordination/Cooperation Committee
- A Network of Linked Local Traffic Signal Control Centers
- Corridor-Wide/Inter-jurisdictional Signal Coordination
- Freeway Diversion Plans and other Incident Management Procedures
- Emergency Vehicle Preemption
- Integrated Freeway Ramp/Ramp Meter and Arterial Street Operations
- Integrated Arterials/CBD Strategy
- Computerized Inventory and Timing Files
- Highway/Railroad Intersection Improvements
- Transit Priority

The ultimate vision for advanced traffic signal control in the Miami Valley is to establish the capability for local jurisdictions to control traffic responsive signal systems via remote locations. As the capabilities of the individual centers evolve and the degree of coordination across jurisdictions increases, linkages may be established among the local signal control centers and between the centers and freeway management and traveler information facilities. The local signal control centers, operated by local jurisdictions, provide the means for manual and automatic (i.e., traffic responsive) updating of signal timing plans and automatic maintenance and malfunction monitoring.

Within each local jurisdiction, the control centers will be developed incrementally in conjunction with the phased upgrading of field hardware. The control centers will also be developed incrementally through the enhancement of existing capabilities and facilities.

Ultimately, and according to the procedures developed cooperatively by participating local jurisdictions, individual local traffic signal control centers will be linked so as to facilitate Inter-jurisdictional coordination of selected multi-jurisdictional traffic signal operations, such as in the case of incidents. The extent of communication/integration among local control centers will vary and will in all cases appropriately retain local control. In addition to being linked with one another, the local signal control centers will be linked to freeway traffic management centers (see Program Area 1) and a central data server for the regional multi-modal traveler information system (Program Area 4).

The long-range traffic control signal system may also include Transportation Demand Management (TDM) policies and strategies that can be implemented by changing the signal preferences to encourage the use of HOV systems and transit systems with signal prioritization. Preferential treatment such as signal priority can be given to high occupancy transit vehicles in the urban street network to maximize passenger throughput or to emergency vehicles to minimize response time and response accidents.

Special signal system improvements may be warranted at selected at-grade railroad crossings. Improvements to warning and advisory systems for both train and roadway vehicle operators can improve safety and improved integration of railroad crossing control into adjacent signal systems can help mitigate the impact of train crossings on traffic flow.

RATIONALE: The program area supports the following Overriding Factors that were developed for the Miami Valley ITS Strategic Deployment Plan:

- Addresses Safety
- Reflects a Region wide Perspective
- Multimodal
- Serves Many
- Maximizes Resources

EXPECTED RESULTS:

The program area addresses the following traffic signal problems identified during the development of the Miami Valley ITS Strategic Deployment Plan:

- Impacts of Detouring Traffic
- Signal System Timing Optimization
- Signal System Modernization and Maintenance
- Inadequate Regional Coordination/Cooperation of Adjacent Arterial Traffic Signal Systems

The program area will address the following User Services:

- Traffic Control
- Incident Management
- Public Transportation Management
- Emergency Vehicle Management
- Demand Management and Operations

		Implementation Timeframe						
		Year					Year 6-10	Year 11-20
2.	**ADVANCED TRAFFIC CONTROL SYSTEMS**	**1**	**2**	**3**	**4**	**5**		
2.1	**Normal Operations**							
2.1.1	Scheduled Timing Plan Updates	X	X	X	X	X	X	X
2.1.2	Microprocessor Controller Conversions	X	X	X	X	X	X	X
2.1.3	Coordinated Traffic Signal System Improvements – Phase I	X	X					
2.1.4	Coordinated Traffic Signal System Improvements – Phase II			X	X	X		
2.1.5	Coordinated Traffic Signal System Improvements – Phase III						X	
2.1.6	Coordinated Traffic Signal System Improvements – Phase IV							X
2.1.7	Highway/Railroad Intersection Study	X						
2.1.8	Highway/Railroad Intersection Improvements		X	X	X	X	X	X
2.2	**Non-Recurring Conditions**							
2.2.1	Emergency Vehicle Preemption Study			X				
2.2.2	Freeway Traffic Diversion Timing Plans	X	X					
2.2.3	Special Event Timing Plans and Procedures	X	X					
2.3	**Institutional Issues**							
2.3.1	Interagency Coordination/Cooperation Committee	X	X	X	X	X	X	X

PROJECT: **2.1- Normal Operations**

Objective: The objective of this project is to outline programs, procedures and phasing for the implementation of advanced traffic signal control in the Miami Valley such that the arterial, ramp terminal and ramp metering signal systems will provide integrated and real-time traffic responsive operations during normal operating conditions and such that the safety of at-grade highway/railroad intersections will be improved and the detrimental impact of train crossings on traffic flow will be minimized.

Current Conditions: Traffic signal equipment within the study area is controlled by each jurisdiction. As such, the technology varies considerably from location to location. There are electro-mechanical, fixed-time controllers operating in an isolated manner, as well as interconnected solid-state controllers controlled by computerized masters or time-based coordination. Table 6.1 summarizes the traffic signal systems of the larger jurisdictions in the study area. The total number of traffic signals in the jurisdiction is shown, along with the percentage of traffic signals which operate in a system and the percentage of solid-state, or microprocessor, traffic signals.

The entire Miami Valley area has invested significantly in signal control equipment that provides motorists with travel benefits through effkient system operation and reduced delays. The majority of large jurisdictions maintain a high percentage of microprocessor equipment. Some communities operate interconnected signal systems using simple hardwire. However, many have invested in closed loop systems or time-based coordination. Also, mostjurisdictions in the study area are in a continuous process of updating their signal systems and installing new equipment.

Dayton utilizes advanced signal control technology and has operated a central computer system for 18 years to control many of the city's arterial street systems. The exception is the central business district, which operates as a reliable, electro-mechanical, interconnected pre-timed system. Also, Dayton is in the process of upgrading and expanding their signal system using state-of-the-art local controllers operated by a central microprocessor.

The cities of Dayton, Kettering, Moraine, Centerville, Miamisburg and O&wood; Greene County; and the MVRPC (Salem Mall system) currently use microprocessor-controlled closed loop signal systems to control traffic. Computerized signal systems have been in place in these areas for as long as 20 years, such as in the case of Kettering and Moraine. These two cities use closed loop microprocessor-based systems for the control of 95 percent of the traffic signals on their arterial streets.

TABLE 6.1
TRAFFIC SIGNAL SYSTEM SUMMARY

Jurisdiction	Total	Percent Interconnected	Percent Microprocessor
Clark County	15		
New Carlisle	3	0	100
ODOT District 7	21		
South Charleston	3		
Springfield	120	30	59
Greene County	24	33	71
Beavercreek	36	61	100
Bellbrook	1	0	0
Fairborn	32	53	100
Jamestown	2	0	0
Xenia	39	51	28
Miami County	3	0	100
ODOT District 7	5	40	80
Pique			
Tipp City	14	0	71
Troy	41	61	100
West Milton	2	0	100
Montgomery county	50	38	100
Brookville	3	0	33
Centerville	28	75	100
Dayton	346	90	64
Englewood	10	20	100
Germantown	4	50	100
Huber Heights	25	76	100
Kettering	66	100	100
Miamisburg	24	100	100
Moraine	26	100	100
New Lebanon	3	0	67

TABLE 6.1
TRAFFIC SIGNAL SYSTEM SUMARYY (CONTINUED)

Jurisdiction	Total	Percent Interconnected	Percent Microprocessor
Oakwood	14	93	86
ODOT District 7	57	67	95
Riverside	29	48	97
Trotwood	22	82	91
Union	2	0	100
Vandalia	14	64	93
West Carrollton	15	80	93
TOTAL	1,099		

Source: LJB; municipal, county and state traffic engineering departments, November 1997

Timing plan updates for the jurisdictions within the study area generally do not follow a schedule. Plans are revised on an as-needed basis, usually to repair problems brought to attention by public complaint or equipment failure/ replacement.

As part of the closed loop systems installed in Dayton, Kettering, Moraine, Centerville, and Greene County the systems are regularly monitored by computer and reviewed by staff. Changes are made as problems are detected.

Springfield, Dayton's Central Business District (CBD), and Miamisburg's relatively small CBD contain simple systems governed by a clock and limited cycle, split, and offset control. The cities of Dayton, Kettering, Moraine, and Centerville have extensive closed loop systems. Dayton and Miamisburg utilize Monarch central control systems which are operated and monitored continuously by computer.

Scope: This project is divided into the following phases:

2.1.1 Scheduled Timing; Plan Updates

This project phase will consist of the implementation of a program to periodically update timing plans for all of the arterial signal systems in the area. This phase will begin in Year One and be continuously ongoing.

Some of the signal systems are currently able to upload and download timing information remotely from the signal maintenance and traffic engineering locations. These closed loop systems are currently capable of providing 'time-of-day" signal timing patterns which optimize operations along the major arterial routes. However, there is no program for periodically updating the signal timings at these locations as this task is typically a lower priority than other signal related issues and is labor intensive. This results in the use of outdated signal timings at some locations where traffic demand conditions have changed since the last update.

The ultimate vision for the Miami Valley area would include the implementation of advanced traffic signal control technologies for normal operations that enable the real-time control of traffic signals. These technologies may include automatic traffic signal optimization, ramp metering, traffic signal prioritization, reversible lane designation and ramp or lane closure systems. The automatic traffic signal optimization component would receive real-time traffic demand information from system detectors, process and analyze this data via a computing system and automatically select and relay an appropriate new timing plan for implementation to each on-line signal location based on pre-established demand thresholds and corresponding timing plans.

The phasing of this program from the current conditions to the ultimate vision of traffic responsive or adaptive control would include several years of manually updating the timing plans at the non-automated locations. However, as additional arterial closed loop segments are added or extended, more and more of this updating will be able to occur from PC's located at the signal or traffic engineering shops. Thus, as the automated system evolves to complete Long-Term implementation, the time spent uploading/downloading and updating timing plans should decrease.

2.1.2 Microprocessor Controller Conversion

This project phase will replace existing traffic signal controllers with microprocessor controllers in those areas not affected through project phases 2.1.3 through 2.1.6 (Coordinated Traffic Signal System Improvements), which implement a range of traffic singnal system improvements culminating in the capability for local jurisdictions to communicate with coordinated signal systems which are operating in a traffic responsive manner. This project phase focuses on those geographic areas not targeted in phases 2.1.3 through 2.1.6. Microprocessor controller upgrades have been established as a separate effort in recognition of the benefits of this type of equipment and their importance as the foundation for nearly all other advanced traffic signal control improvements. This effort will be phased over Years 1 through 10 of the ITS deployment program.

2.1.3 Coordinated Traffic Signal System Improvements - Phase I

This project phase includes a range of incremental traffic signal improvements which, when complete, will provide local jurisdictions the ability to communicate, via a local Traffic signal control location, with their coordinated traffic signal systems. Included in this capability is the ability to perform maintenance and malfunction monitoring, update timing plans remotely, and implement traffic responsive signal control strategies.

Implementation of these improvements has been divided into three phases, with this phase focusing on the roadways that were identified as priorities by local traffic engineers and which were also identified in the Strategic Deployment Plan process as having capacity and/or safety deficiencies. The other priority locations have been included in either Phase II or Phase III based on the same criteria. The locations of the improvements are shown graphically by phase and county in Figures 6- 11 through 6- 14 and listed in Table 6.2.

The specific improvements implemented in this project phase will vary by location. Examples of the types of improvements to be implemented include the following:

- upgrading controllers (e.g., from electro-mechanical to microprocessor controlled);

- implementing or upgrading/augmenting vehicle detection systems (e.g., installing inductive loops, replacing loops with other detection technologies such as video or microwave, etc.);

- coordinating traffic signals which are currently operating independently, extending existing coordinated systems;

- upgrading the level of coordination among traffic signals which are currently coordinated (e.g., replacing time-based coordination with twisted, fiber optic and/or leased telephone line interconnection; and

- implementing communication systems between coordinated signal systems and local control locations.

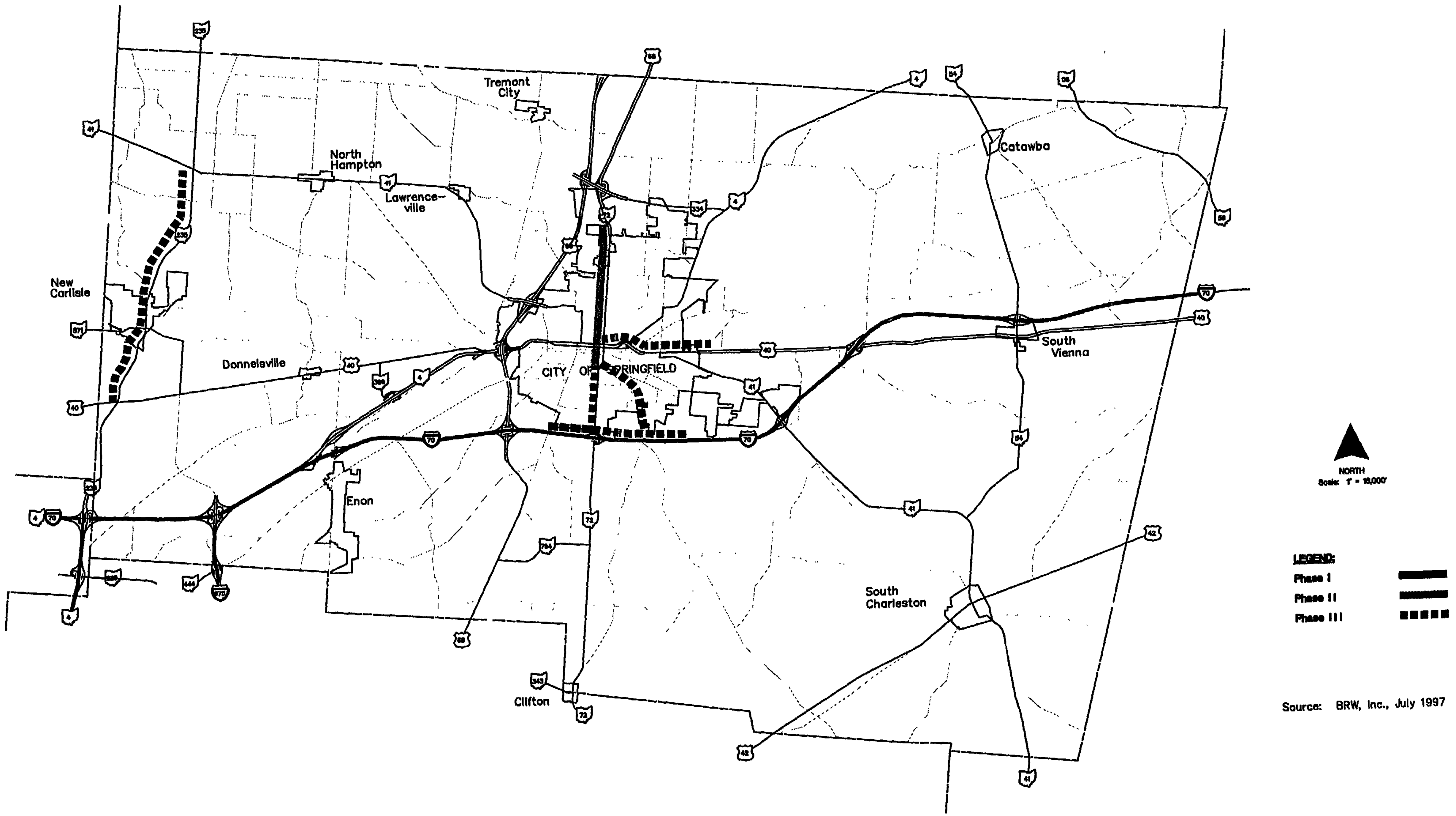

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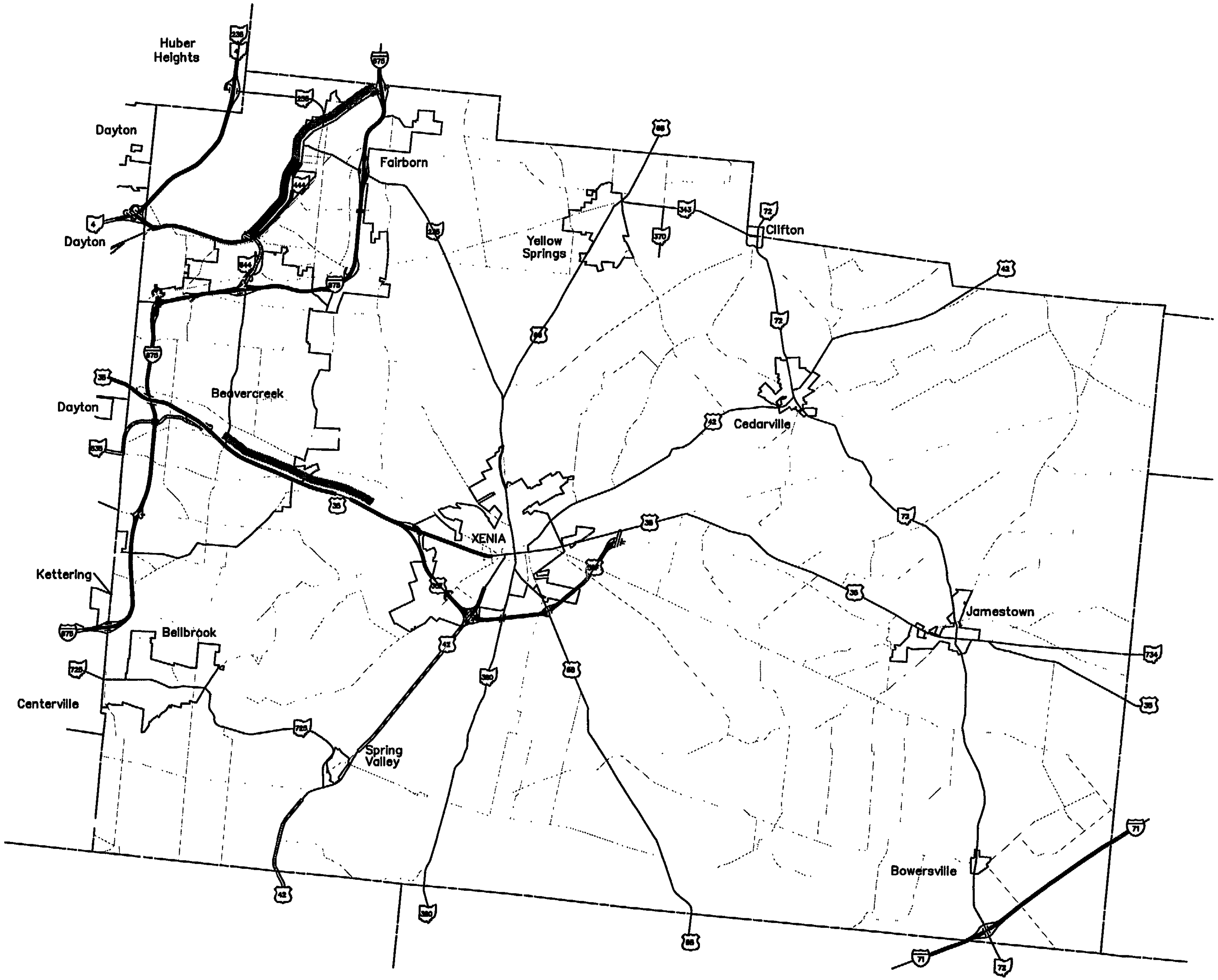
Figure 6-11
COORDINATED TRAFFIC SIGNAL SYSTEM IMPROVEMENTS CLARK COUNTY

clark.dwg 9-3-97



LEGEND:

Phase I	▬▬
Phase II	▬▬
Phase III	■■■■■

Source: BRW, Inc., July 1997

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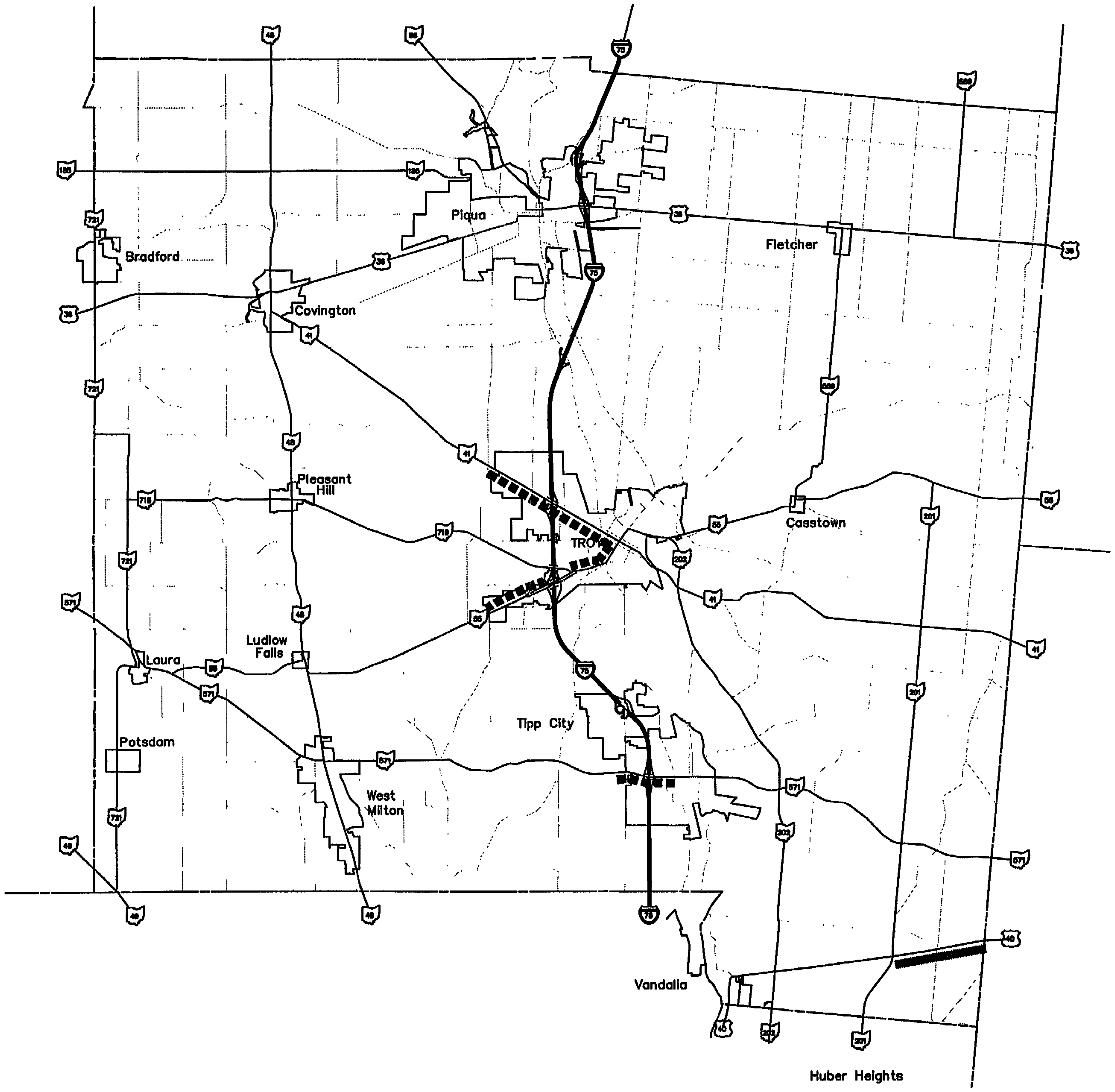
Figure 6-12

COORDINATED TRAFFIC SIGNAL SYSTEM IMPROVEMENTS GREENE COUNTY



Source: BRW, Inc., July 1997

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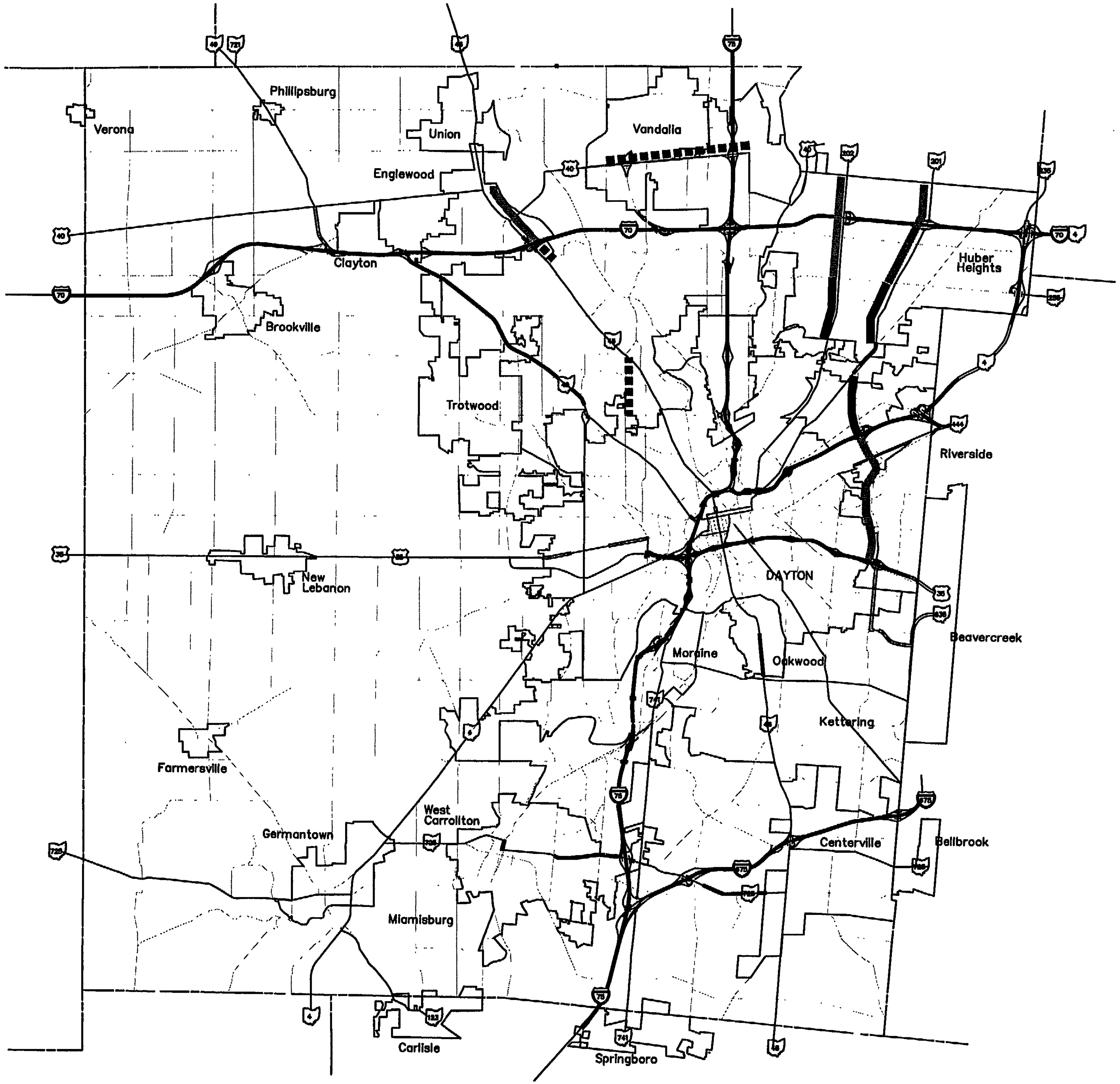
Figure 6-13
COORDINATED TRAFFIC SIG
SYSTEM IMPROVEMENTS
MIAMI COUNTY



Source: BRW, Inc., July 1997

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Figure 6-14
COORDINATED TRAFFIC SIGNAL SYSTEM IMPROVEMENTS MONTGOMERY COUNTY

This project phase provides the signal system hardware required for local jurisdictions to communicate with their coordinated signal systems. Issues associated with establishing relations between local control centers across jurisdictions, including information sharing and other procedures, is addressed in Project Phase 2.3.1, which recommends establishment of a regional Interagency Traffic Signal Coordination/Cooperation Committee. The Committee will also address the institutional issues (e.g., operating agreements, etc.) associated with utilizing the equipment implemented in this project phase to provide signal system coordination across jurisdictional boundaries.

The centralized control capabilities provided through this project phase will allow for the maintenance and malfunction monitoring of traffic signals, the integration of signal systems, the implementation and monitoring of emergency vehicle and railroad pre-emption calls and the implementation of traffic responsive control.

2.1.4 Coordinated Traffic Signal System Improvements - Phase II

This project phase continues the implementation of the traffic signal capabilities described in phase 2.1.3 but focuses geographically on the areas identified for Phase on Figures 6-l 1 through 6-14 and Table 6.2.

2.1.5 Coordinated Traffic Signal System Improvements - Phase III

This project phase continues the implementation of the traffic signal capabilities described in phases 2.1.3 and 2.1.4 but focuses geographically on the areas identified for Phase on Figures 6-11 through 6-14 and Table 6.2.

2.1.6 Coordinated Traffic Signal System Improvements - Phase IV

This project phase continues the implementation of the traffic signal capabilities described in phases 2.1.3 through 2.1.5 but focuses on locations not targeted as during Phases I through III. The locations identified for implementation in Phases I through III are those identified as priorities by local traffic engineers. This project phase will implement improvements at locations determined to be priorities in the future.

Table 6.2
SUMMARY OF COORDINATED TRAFFIC SIGNAL SYSTEM IMPROVEMENTS

County	Phase	Roadway	Segment (1)
Clark	Phase II	SR 72 (south to north)	Sehna Road to Eagle City Road
	Phase III	SR 72 (south to north)	Leffel Lane to Sehna Road
		US 40/East Main Street (west to east)	Limestone St. to East Corporate Line
		SR 235 (south to north)	US 40 to SR41
		Sehna Road (south to north)	Leffel Lane to SR 72
		Leffel Lane (west to east)	Springfield-Xenia Rd. to Burnett Rd.
Greene	Phase I	SR 444 (west to east)	SR 844 to end of divided highway
	Phase II	SR 444 (west **to** east)	Start of undivided highway to I-675
		US 35 (west to east)	North Fairfield Road to Valley Road
Miami	Phase III	SR 4 1 (south to **north)**	Market Street to Washington Pike
		South Market Street (south to north)	West Market Street to Main Street
		SR 57 1 (west to east)	Just west of I-75 to Hyattsville Road
		SR 55 (west to east)	Nashville Road to I-75 SR 7 18 to South Market Street
Montgomery	Phase I	SR 202 (south to north)	Huber Heights South Corporate Limits to Chambersburg Road
		SR 20 1 (south to north)	Kitridge Road/Huber Heights South Corporate Limits to Chambersburg Road
		Woodman Drive/Harshman Road (south to north)	SR 4 to SR 201
	Phase II	SR 202 (south **to** north)	Chambersburg Road to Miami Co. Line
		SR 20 1 (south to north)	Chambersburg Road to Miami Co. Line
		Woodman Drive/Harshman Road (south to north)	Linden Avenue to SR 4
		SR 48 (south to north)	I-70 to divergence from US 40
	Phase III	SR 48 (south to north)	Garber Road to I-70
		National Road/US 40 (west to east)	Dogleg Rd. to Brown School House Rd.
		Philadelphia Drive (south to north)	Siebenthaler Avenue to Turner Road

(1) All locations are approximate.

Source: BRW, Inc., May 1997

2.1.7 Highway/Railroad Intersection Study

This project phase consists of a study of at-grade railroad/highway intersections (HRIs) to identify and prioritize locations and to identify specific improvement strategies for high priority locations. Prioritization may be based in part upon a hazard index (ADT trains x ADT vehicles) and/or historical accident data. The higher priority HRI crossings would then be identified and evaluated to determine their susceptibility to correction via ITS strategies. The resulting report would recommend the implementation of specific ITS strategies/components at high priority crossings where implementation could have a significant impact and where implementation was cost feasible.

Based on the input provided by local traffic engineers throughout the Miami Valley, this effort should focus on Clark County, where, according to the engineers consulted with, at-grade rail crossing issues are most significant. The scope of this project phase could be broadened to include any other jurisdictions who desire to be included.

2.1.8 Highway/Railroad Intersection Improvements

This project phase will consist of implementing the improvements identified in project phase 2.1.7. Possible implementation strategies would include the following:

- Providing advisories and alarms to train crews of HRI warning device operational status and highway vehicle occupancies within the HRI

- Automated stopping of trains in emergency situations when an obstructing vehicle can be automatically detected in time for the tram to avoid a collision.

- CMS's on major HRI approaches. The signs could inform motorists of the presence of an HRI ahead and the need to exercise caution. These signs may also inform the motorist of the time to train arrival, expected delay times, and possible alternative routes to avoid excessive delays resulting from signal malfunctions or unusually slow trains. The signs may also inform the motorist if a train is already in the HRI and warn the motorist to stop.

- In vehicle motorist advisory and warning functions. This information may initially be provided only in school buses and emergency service vehicles.

- Four quadrant gate technologies to prevent motorists from going around gates.

- Improved integration of HRI active warning devices with highway traffic control systems. This may include incorporating standard red-yellow-green lights at HRI locations consistent with typical traffic control.

The train data could also be relayed to emergency services personnel, police, fire, and ambulance services, to facilitate routings which avoid blocked HRI's and thereby optimize emergency response time. Similar actions could be implemented by the centralized operations center in the event of HRI signal malfunctions.

The ultimate system would likely require centralized control and thus a communications link to a local traffic signal control center. However, some early strategies could be accomplished with more distributed intelligence. Sensing, communications, processing and control functions can take place directly between trains, HRI's and highway vehicles to provide may strategies.

Location: This project includes phases focusing on specific locations and phases with a regional orientation. The timing plan updates (2.1.1) and microprocessor conversion (2.1.2) efforts will involve locations throughout the Miami Valley. The signal improvements implemented in phases 2.1.3 through 2.1.5 will focus on the specific locations identified in Figures 6-l 1 through 6-14 and Table 6.2. The focus of the highway/railroad intersection project phases (2.1.6 and 2.1.7) will be Clark County.

Technology: The phases of this project will utilize a wide range of advanced traffic signal control technologies, including vehicle detection (e.g., inductive loops, microwave, etc.), communication (e.g., twisted pair, fiber optic, etc.) and software (e.g., timing plan development and inventorying, maintenance and malfunction monitoring, etc.) elements.

Administration: Project phases 2.1.1 through 2.1.6 should be administered by the local entities responsible for traffic signals within the relevant geographic areas. The Clark County-Springfield Transportation Coordination Committee should administer project phase 2.1.6, with the relevant local jurisdictions administering the implementation in phase 2.1.7. It is recommended that a consultant experienced with highway/railroad intersection safety and operational issues as well as with ITS traffic control strategies be retained to conduct the study of HRIs (2.1.6).

Time Frame: The program to update timing plans can begin in Year 1 and will continue indefinitely. However, over time, the number of traffic signals requiring manual field updates will reduce as more traffic signals come on line which can be updated from a remote location. The conversion to microprocessor signal controllers can begin in Year 1 and is recommended for completion within ten years. Coordinated signal system improvements can begin in Year 1 with the highest priority locations as identified for Phase I. Improvements at all of the locations so far identified can be completed by the end of Year 10 and improvements at locations that will be identified in the future will occur between Years 11 and 20. The HRI study should be completed within the first year of the ITS program and HRI improvements can occur in a phased manner over Years 2 through 20.

PROJECT: **2.2 - Non-Recurring Conditions**

Objective: This project develops and implements plans and procedures to improve the safety and efficiency of moving emergency vehicles through signalized intersections and to improve the performance of traffic signals during freeway incidents and special events.

Current Conditions: Springfield has an extensive priority operation utilizing the 3M Opticom System. Other scattered local preemption systems for fire/emergency exist, but in most cases these relate only to single intersections or small systems, usually in the vicinity of a fire station or hospital. Most of the signal systems in the area have preempt capability, though it may not be in use.

There are no specific special event timing plans used throughout the study area. The closed loop system operators generally implement various school, athletic event, parade, church, and heavy shopping period timing programs.

Scope: 2.2.1 Emergency Vehicle Preemption Study

This project phase consists of a study to identify where, if anywhere, emergency vehicle preemption (EVP) of traffic signals is warranted. EVP would allow emergency services vehicles to interrupt the normal traffic signal timing along the traveled route to reduce emergency response time and the likelihood for emergency vehicle crashes while responding.

EVP enables authorized vehicles to activate a special phase selection sequence that would interrupt normal signal operation and provide a priority right-of-way. Civilian traffic responds appropriately because drivers react naturally to their red or green signal indications. After the emergency vehicle efficiently crosses the intersection the intersection returns quickly to its regular routine.

The EVP is enabled by the driver of the emergency vehicle by activating an emitter switch in advance of the traffic signal. The emitter device uses coded infrared transmissions to communicate the desired preemption to the signal controller. The receiving devices are typically mounted on traffic signal mast arms.

This study should closely involve representatives of emergency response organizations such as police and fire departments and should be coordinated with the efforts of the Interagency Traffic Signal Coordination/Cooperation Committee described in Project 2.3. This project phase should also coordinate with the incident management activities described in Program Area 1 and the project phase devoted to developing diversion plans for freeway incidents discussed elsewhere in this program area. This study should also be coordinated with the broader assessment of potential transit priority treatments, including those which involve traffic signals, which is recommended in Program Area 3, Public Transit Systems.

The study would identify the emergency vehicle routes which have safety and/or congestion problems and which therefore represent the highest priorities from the perspective of the emergency responders. The feasibility of EVP and the specific strategy to be pursued would then be investigated for each signal along the priority routes. The feasibility assessment should consider and weigh all of the issues associated with emergency vehicle preemption from both the responders and signal operators viewpoints, including costs, liability, etc.

2.2.2 Freeway Traffic Diversion Support Timing Plans

This project phase will consist of the development of signal timing plans to be implemented when freeway traffic diverts onto arterial streets in response to freeway incidents. This project should be closely coordinated with the incident management projects recommended in Program Area 1 and timing plans should be developed within the context of a broader effort to identify the role of specific arterial streets during freeway incidents. These issues will occur through the task force established in Project 1.4, which will establish regional consensus on incident management procedures, including those which impact arterial streets.

Development of the diversionary timing plans and the arterial street issues associated with incident management will both be coordinated with the Interagency Traffic Signal Coordination/Cooperation Committee recommended in project 2.3 and the Traffic/Transit Management Working Croup described in the Implementation Plan section of this report.

Diversionary timing plans and procedures would provide for changing the normal traffic signal settings along major arterial routes to expedite the flow of traffic diverting around an incident site. These plans may also be used during the prolonged construction of an adjacent parallel arterial route.

The ability to respond effectively to freeway incidents is improved greatly when arterial street, ramp terminal and ramp meter traffic signals can be coordinated. Project phases 2.1.3 through 2.1.6 establish the capability (at selected locations only) for individual signal jurisdictions to control their traffic signal systems remotely, including the ability to implement special timing plans. The type of coordination among jurisdictions which is so useful during incidents would require selected integration of control capabilities among various individual jurisdictional control centers, one of the issues to be addressed by the Interagency Traffic Signal Coordination/Cooperation Committee recommended in project 2.3.

2.2.3 Special Event Timing Plans and Procedures

This project phase develops and implements special timing plans and other traffic control procedures for special events, such as sporting events, boat/car shows, concerts, etc. In cases where event traffic operations significantly impact, and are significantly impacted by, freeway operations, the plans produced in this phase should be closely coordinated with several projects in the Freeway/Incident Management Program Area, especially 1.4.1 (portable traffic management system for construction/special events) and 1.2.7 (major generator/local advanced traveler information system).

Location: The EVP study will focus on selected, high priority routes throughout the Miami Valley. The Diversionary timing plans will be implemented along selected routes identified as part of the incident management process addressed in project 1.4 in the Freeway/Incident Management Program Area. Special event timing plans will be implemented at event facility locations scattered throughout the Miami Valley.

Technology: The phases of this project will utilize a wide range of advanced traffic signal control technologies, including vehicle detection (e.g., inductive loops, microwave, etc.), communication (e.g., twisted pair, fiber optic, etc.) and software (e.g., timing plan development and inventorying, maintenance and malfunction monitoring, etc.) elements.

Administration: The Miami Valley Regional Planning Commission is recommended to administer the EVP and diversionary timing plan phases given their regional scope. The development of special event timing plans should be administered by the individual affected jurisdictions. In cases where multiple jurisdictions are involved, the MVRPC is recommended.to play a facilitation/oversight role. All of the phases identified in this project should be closely coordinated with both the Traffic/Transit Management Working Croup described in the Implementation Plan section of this report and the Interagency Traffic Signal Coordination/Cooperation Committee described in project 2.3 of this program area. As described in the individual scopes, all of the phases of this project should be coordinated with the broader incident management efforts described in Program Area 1.

Time Frame: The EVP study can begin immediately but has been recommended for Year 3 given the priority of this issue ascribed by the local traffic engineers who were involved in the development of this project. The study can be completed in less than one year. Both the diversionary timing plans and the special events plans and procedures should begin in Year 1 and can be completed by the end of Year 2.

PROJECT: **2.3 Institutional Issues**

Objective: This project establishes a regional forum for the promotion of interagency coordination on traffic signal issues and the integration of local traffic signals and signal systems into the regional ITS system to be deployed over the next 20 years.

Current Conditions: There is currently no dedicated, formal organization or mechanism for regional coordination on traffic signal issues. The amount of coordination among jurisdictions currently varies widely and includes shared control of closed-loop systems, integration of selected Ohio Department of Transportation controlled traffic signals into locally controlled traffic signal systems and plans to share arterial street traffic surveillance data (Cities of Kettering and Moraine). Coordination on signal issues currently occurs through a number of informal channels and through existing regional transportation coordination efforts not dedicated to signal issues.

Scope: This project consists of the following phase:

2.3.1 Interagency Coordination/Cooperation Committee

This committee will meet regularly and indefinitely to address a wide range of issues associated with regional traffic signals coordination and cooperation and integration of local traffic signals into the regional ITS system which will be deployed over the next 20 years. Issues to be considered by this group include:

- Coordination of traffic signal systems across jurisdictional boundaries, such as in the case of a major multi-jurisdictional corridor that would be best controlled by a single coordinated traffic signal system operated by a single entity.
- Establishing linkages between local traffic signal control centers with other control centers and with freeway management system and traveler information control facilities (which in many cases may be combined with signal control facilities).
- Coordination of freeway and arterial street traffic operations during incidents and special events, including designation of the specific role of specific arterial streets during various incident scenarios.
- Integration of freeway ramp meter and ramp meter terminus traffic signals with adjacent arterial street traffic signals.

- Equipment standards and protocols. Standardization can allow individual agency inventories to be reduced when equipment loan arrangements are made with other agencies using the same equipment, reduce the need for specialized skills associated with a wide range of equipment types, allow multi-agency bulk purchasing and is necessary in order to coordinate traffic signals across jurisdictions.

- A wide range of other non-ITS traffic signal issues which can benefit from regional coordination and cooperation, including signal warrants, pedestrian and bicycle treatments (including calibration of detection hardware to detect bicycles), etc.

Location: NA

Technology: NA

Administration: The Miami Valley Regional Planning Commission is recommended to administer this project. The activities of the Interagency Traffic Signal Coordination/Cooperation Committee should be coordinated with the Traffic/Transit Management Working Croup described in the Implementation Plan portion of this report.

Time Frame: This project should begin in Year 1 and continue indefinitely.

PROGRAM AREA: 3 - PUBLIC TRANSPORTATION SYSTEMS

DESCRIPTION: This program area outlines a variety of projects directed at enhancing Miami Valley area public transit services. As projects in this program area are undertaken, opportunities for coordinating with human service agencies that also provide transportation services will be explored.

The first initiative under this program area is to establish an automatic vehicle location system (AVL) using global positioning system (GPS) technology that identifies, in real time, the location of transit vehicles and determines the status of each vehicle relative to its schedule. The AVL system will provide the means to monitor individual vehicle's adherence to their schedule, help passengers make timely transfers, provide more efficient transit services and inform transit managers and the public of the precise location of vehicles. The AVL system will form the basis for several other projects in this Program Area.

A second project in this program area will implement an automated system installed on buses to collect and process boarding, run time and mileage data. Under the initial phase, the Miami Valley Regional Transit Authority (MVRTA) fleet will be outfitted with the Springfield City Area Transit (SCAT) equipped in a later phase.

A Regional Mobility Management concept will also be demonstrated under this program area. The Regional Mobility Management concept is *an integrated, multi-provider approach to matching regional transit demand with available* resources. The Regional Mobility Management concept is expected to generate significant efficiencies and costs savings, improve the quality of transit service and result in service to more people.

Timely and accurate information is important to transit users and under this program area, convenient, up-to-the minute information on the status of scheduled service will be provided in a number of different ways. Up-to-the minute information will be made available through electronic displays at major MVRTA transfer locations/bus stops, on-board, automatic voice synthesized annunciators and on-board electronic signs that announce/display upcoming MVRTA transit stops and other helpful information. The AVL system developed early on in tbis program area will generate the up-to-the minute information.

Adjusting traffic signals to accommodate transit schedules will also be explored under this program area. Traffic signal priority systems can improve bus travel times and on-time performance and help improve the attractiveness of transit as an alternative to single occupant vehicles. An initiative will be under taken to examine the feasibility of and to develop a regional strategy for a transit vehicle traffic signal priority system.

As detection and surveillance systems become operational in the Miami Valley area, a wealth of valuable information will be available on current traffic and roadway conditions. Data feeds can be established between regional traffic management system(s) and interested regional transit providers. Additionally, selected data from the transit agencies will be provided to freeway/incident management control facilities and to the regional traveler information system central data server.

This real-time traffic condition information can assist transit operators with managing headways, adhering to schedules and coordinating timed transfers. Traffic condition information will become even more important as flexible route deviation and general public demand responsive transit projects are deployed.

RATIONALE: This program area addresses the following Overriding Factors that were developed for the Miami Valley Strategic Deployment Plan:

- Reflects a Region-Wide Perspective
- High Visibility
- Early Winner
- Accepted by Users
- Marketable

EXPECTED RESULTS: This program area addresses the following top transit problems identified during the development of the Miami Valley Strategic Deployment Plan:

- Lack of Information/Not User Friendly
- Low Ridership
- Land Use Policy/Development Patterns
- Insufficient Service: Inadequate Route Coverage

3. PUBLIC TRANSIT SYSTEMS	Implementation Timeframe						
	Year					Year 6-10	Year 11-20
	1	2	3	4	5		
3.1 Automatic Vehicle Location Systems							
3.1.1 MVRTA Automatic Vehicle Location & Schedule Adherence Monitoring	X	X					
3.1.2 MVRTA Connection Protection Program		X					
3.1.3 MVRTA Fixed Route Deviation Transit			X	X	X		
3.1.4 MVRTA General Public Demand Response						X	
3.1.5 SCAT Automatic Vehicle Location & Schedule Adherence Monitoring						X	
3.1.6 Project Mobility “Smart” Technologies			X	X	X		
3.1.7 SCAT “Smart” Technologies						X	
3.1.8 Miami County “Smart” Technologies						X	
3.1.9 Technological Support for Regional Human Service Transportation provider Coordination		X	X	X	X	X	X
3.2 Automated On-Board Fare and Data Collection							
3.2.1 MVRTA Automated Collection of Run Time, Passenger Loading and Mileage Data		X	X	X			
3.2.2 SCAT Automated Collection of Run Time, Passenger Loading and Mileage Data					X	X	
3.2.3 SCAT Electronic Fare Collection							X
3.3 Regional Mobility Management							
3.3.1 Mobility Management Demonstration						X	
3.4 Transit Traveler Information							
3.4.1 MVRTA Electronic Station Displays		X	X				
3.4.2 SCAT Electronic Station Displays						X	
3.4.3 MVRTA On-Board Annunciators and Automatic Visual Information Signage			X	X	X		
3.4.4 SCAT On-Board Annunciators and Automatic Visual Information Signage						X	
3.5 Transit Traffic Signal Priority Systems							
3.5.1 Regional Transit Traffic Signal Priority Systems						X	
3.6 Coordination with Traffic Management and Traveler Information Systems							
3.6.1 Regional Traffic Management and Traveler Information Systems Data Feeds			X				

PROJECT: **3.1 - Automatic Vehicle Location Systems**

Objective: To establish an automatic vehicle location system (AVL) using global positioning system (GPS) technology to identify, in real time, the location of transit vehicles and determine the status of each vehicle relative to its schedule. The AVL system will form the basis for other projects in this Program Area. The AVL system will provide the means to monitor individual vehicle's adherence to their schedule, help passengers make timely transfers, provide more efficient transit services and inform transit managers and the public of the precise location of vehicles.

Current Conditions: None of the transit agencies in the Miami Valley currently have automatic vehicle location or automated schedule adherence monitoring capabilities, although AVL is being considered for future implementation by the Miami Valley Regional Transit Authority. Currently, vehicle locations are estimated based on schedules and confirmed through two-way voice radio between drivers and dispatchers.

Scope: This project is implemented in nine separate phases over Years 1 - 10. The initial phase implements an AVL system and subsequent phases use the system to enhance Miami Valley area transit services. Following is a detailed description for each phase of this project.

3.1.1 MVRTA Automatic Vehicle Location and Schedule Adherence Monitoring

This initial phase includes the design and deployment of an AVL system for the Miami Valley Regional Transit Authority (MVRTA) and their fleet of approximately 250 vehicles. Deployment of the AVL system is expected to be implemented over a period of two years. Eventually, the AVL system is expected to be expanded on a limited basis to include other transit providers.

The AVL system will consist of components installed on each transit vehicle along with installations at the transit operations center. A global positioning system (GPS) will form the basis of the AVL system and a geographic information system (GIS) will be used to develop a map of the service area. The GIS map is utilized at the transit operations base to visually display the vehicle locations and to match the vehicle location data transmitted by the on-board AVL devices with actual roadway locations, including transit stops. The GIS map is used for all of the travel time calculations that are required to determine vehicle status and projected arrival time.

The capabilities provided under the AVL system are wide-ranging and include the following:

- alerting drivers, either through conventional (e.g. voice radio) or advanced techniques (e.g. mobile data terminals) of their status relative to the schedule;

- instructing drivers to take corrective actions to maintain their schedules;

- displaying projected arrival times on traveler information devices, including active station signs, kiosks, on-board vehicle signs and devices and automated or manual telephone information services;

- manually or automatically triggering traffic signal priority devices;

- instructing drivers to wait at a transfer point or to inform them that a person ahead is waiting to make a transfer (connection protection).

The information generated by the AVL system will also serve as a powerful planning tool. Historic schedule adherence data can be stored and analyzed, then utilized in route and schedule planning and refinement.

The experience from deploying an AVL system for MVTRA will be used to help other fleet operators determine if an AVL system could benefit their operations. For example police and emergency dispatchers may experience faster response times with an AVL system, school bus operators may be able to more efficiently track and schedule their vehicles and managers of municipal services may be able to better track their fleets. Additionally, there may be opportunities to consolidate purchases and to coordinate the development of communications infrastructure.

3.1.2 MVRTA Transfer Coordination Program

This phase of Project 3.1 implements a system to coordinate transfers between MVRTA services including fixed route and paratransit (Project Mobility) vehicles. The ability to coordinate transfers is based on the AVL system developed under the first phase of this project.

The location and expected arrival times of connecting buses are automatically determined by the AVL system. When it is determined that one or both of the vehicles is running late and the transfer could be missed, the system will alert transit operations staff who may in turn implement a number of responses, including having the earlier bus wait for the arrival of the later bus. This would allow connecting passengers to wait for their connecting bus in the security of a transit vehicle.

Connection coordination would initially focus on high volume and "critical" connections - those where there are few other timely options if the connection is missed. This program will be deployed incrementally with more connections "protected" as the program expands. The connection coordination concept is especially important for paratransit operations where patrons may have special needs that prohibit them from waiting unattended for their connecting bus.

3.1.3 MVRTA Fixed-Route Deviation Transit Service

This phase implements fixed-route deviation transit service and utilizes the AVL system established under the first phase of this project. Under this phase, a route deviation service will be established under which customers make reservations for pick-ups at designated locations not served by fixed routes. Utilizing the AVL system, transit operators determine if a particular bus has time to deviate from their fixed-route to serve the trip and if so, authorize the route deviation. This capability can significantly increase route coverage without adversely impacting operating efficiency.

It is recommended that this phase begin on a limited basis in year 3, and involve a limited number of bus routes This will allow the MVRTA to evaluate the benefit of this service prior to investing in major capital expenditures.

3.1.4 MVRTA General Public Demand Responsive Service

This phase will utilize a combination of technologies to provide high-efficiency, demand-responsive transit service to the general public. The AVL system will be used to identify vehicle location & status at all times, then help identify the vehicle best suited for a particular trip. This process is expected to result in dispatching demand-responsive vehicles in a much more efficient manner. This service could also provide suburban and/or neighborhood feeder service to MvRTA's transit hubs.

This phase will be deployed incrementally beginning in year 6 with a limited number of vehicles and a limited service area.

3.1.5 SCAT Automatic Vehicle Location and Schedule Adherence Monitoring

This phase is similar to phase 3.1.1 except that an AVL system will be installed on the Springfield City Area Transit fleet. This phase will begin in year 6, after the MVRTA fleet is equipped and has operating experience with the AVL system.

3.1.6 Project Mobility "Smart" Dispatch Capabilities

This phase links the automatic vehicle location system with mobile data terminals in the transit vehicles. These systems will be used in conjunction with Project Mobility's existing computer-aided scheduling and dispatch capabilities and will allow the agency to respond dynamically to same day trip reservations and better fill trip cancellations.

The AVL system will help Project Mobility identify which, if any vehicles, are available to serve a specific trip request. The mobile data terminals will be used to display pick-up and drop-off schedules to the drivers, communicate trip cancellations and additions and to transmit pick-up and drop-off confirmation data to the operations center. This phase is scheduled to begin in year 3.

3.1.7 SCAT "Smart" Paratransit Technologies

This project implements a range of ITS technologies to improve the operational efficiency of Springfield City Area Transit's (SCAT) paratransit service. Potential technologies include computer-aided scheduling and dispatch, automatic vehicle location (AVL)/geographic information system (GIS) and mobile data terminals. These technologies will improve vehicle utilization through more dynamic scheduling and dispatch, including same-day trip reservations and filling cancellations.

The computer-aided scheduling package will reduce the time required to prepare schedules and will assist with vehicle routing. The AVL/GIS will allow SCAT to determine, in real-time, the position of each vehicle and the vehicle that is best situated to serve a particular trip. The mobile data terminals will be used to display pick-up and drop-off schedules to the drivers, communicate trip cancellations and additions and to transmit pick-up and drop-off confirmation data to the operations center.

This phase is proposed for implementation when SCAT's paratransit operation expands to at least 20 vehicles and is expected to occur in years 6-10.

3.1.8 Miami County "Smart" Technologies

This phase is similar to phase 3.1.7 except that the City of Piqua and Miami County Transit Systems are the focus. As with phase 3.1.7, this phase is proposed only when there is a fleet of at least 20 vehicles.

3.1.9 Technical Support for Regional Human Service Transportation Provider Coordination

This phase provides technical assistance to human service agencies and encourages coordinated ITS initiatives. This phase reflects the findings from the Greene County Transit Study (Greene County Commission and Miami Valley Regional Planning Commission, 1996), that states in part that the potential exists to "…. draw these institutions into a pool each offering its resources to the pool to be able to match the required level of service for any given day to the geographically diverse demand for that service".

Initially under this phase, potential ways to use ITS for coordinating human service agency transportation operations will be explored. Options that will be considered include AVL technology, multi-agency telephone reservation systems, shared use of scheduling and dispatch software, consolidated scheduling and dispatch facilities and shared communications infrastructure. The experience from other initiatives under this project will be shared with area human service agencies and evaluated to identify opportunities for coordination.

A second part to this phase, which can begin sometime shortly after Year 5 and will continue in a phased fashion through Year 20 of the regional ITS deployment, will consist of developing a specific strategy for human service agency coordination, including identifying the participating agencies, developing a service vision and specific operating strategy, and identifying the specific technologies required to implement the strategy.

It is likely that the coordination strategy that will be developed will incorporate elements of the mobility manager concept and will utilize automated scheduling and dispatch software, automatic vehicle location, mobile data terminals (MDT) and integrated/automated fare systems. The AVL and MDT technology will improve the efficiency of the individual human service agencies by providing a means for monitoring schedule adherence and vehicle utilization and by preserving historic data for off-line analysis of scheduled versus actual travel times, load times, etc. This technology also provides the ability to locate an available vehicle and communicate a schedule change quickly and efficiently. The selected strategy will also likely feature some extent of integration of scheduling and dispatch functions across multiple agencies where a single schedule would be prepared utilizing the combined fleets of multiple agencies.

Location: The technologies implemented in this project will include on-board as well as base station hardware. Base station equipment will be installed at the existing dispatch/operations centers of the MVRTA, City of Piqua Transit, Miami County Transit and Springfield City Area Transit. Most of the project phases will impact transit operations throughout the respective service areas of the implementing providers.

Technology: The on-board technology components for the AVL system include:

- a navigational device to determine the vehicle's location;
- a computer to perform data storage and processing; and
- a communications system to connect the various on-board components; and
- a wireless communication system to communicate the vehicle's location to the transit operations center.

The AVL system will also use similar technology at the transit operations center to perform the following functions:

- receive and process vehicle location data;
- graphically display vehicle locations and status on maps;
- automatically calculate vehicle schedule adherence;
- to automatically alert transit operations staff of vehicles that are either ahead or behind schedule by a pre-determined threshold;
- immediate location of any particular vehicle; and,
- to compile and store location data by vehicle, route, driver, time and date for future analysis.

Electronic mapping using a geographic information system (GIS) will be a part of the AVL system along with mobile data terminal for sending messages electronically to and from vehicles.

Administration: It is recommended that Miami Valley Regional Transit Authority have overall responsibility for this project and assign staff to lead the development of the AVL system, connection protection program, fixed route deviation service and general public demand service. Springfield City Area Transit staff should lead phases 3.1.5, 3.1.6, & 3.1.7 and Miami County staff should lead phase 3.1.8. Staff from the Miami Valley Regional Planning Commission are recommended to lead phase 3.1.9 and to participate in all phases under this project to insure consistency between phases. Consulting assistance may be required at different points to assist staff with, technical, administrative and management services.

Time Frame: Phase 3.1 .l marks the start of this project and is expected to be completed during the second year. Once phase 3.1.1 is completed the connection protection program (3.1.2) will commence along with the initial efforts to coordinate human service agency transportation. MVRTA route deviation service (3.1.3) and Project Mobility "smart" technologies (3.1.6) will follow in years 3-5. In years 6 -10, phases 3.1.4, 3.1.5, 3.1.7 and 3.1.8 will commence.

PROJECT: 3.2 - Automated On-Board Fare and Data Collection

Objective: To install an automated system that collects and processes boarding, run time and mileage data on the Miami Valley Regional Transit Authority (MVRTA) and Springfield City Area Transit (SCAT) bus fleets. This project will also deploy an electronic fare collection system in SCAT vehicles.

Current Conditions: Of the transit operators in the region, only the MVRTA has automated fare collection equipment. None of the agencies have automated data collection capabilities, although the MVRTA is investigating the possible future implementation of automatic passenger counters.

Scope: This project is undertaken in four separate phases. Under two of the phases a system that automatically collects run time, passenger loading and mileage data will be implemented for MVRTA and SCAT respectively. Two other phases will implement an electronic fare collection system for MVRTA and SCAT respectively. Following is a brief description of each phase.

3.2.1 MVRTA Automated Collection of Run Time. Passenger Loading and Mileage Data

Under this phase of Project 3.2, each of the 250 plus vehicles in the MVRTA fleet will be equipped with an automated system that collects and processes boarding, run time and mileage data. The data will be collected via on-board vehicle sensors, stored on the vehicle and later downloaded at the transit operations center. The information will be helpful to MVRTA staff and policy makers as they assess bus routes, schedules and fare structuring. This project utilizes the AVL capabilities implemented in Project 3.1 by associating passenger boardings and vehicle stops/starts with specific geographic locations.

3.2.2 SCAT Automated Collection of Run Time. Passenger Loading and Mileage Data

This phase is similar to 3.2.1 except that an automated system for collecting and processing boarding, run time and mileage will be installed on the SCAT fleet. This phase will be undertaken after the MVRTA fleet is equipped and is expected to commence in Year 5.

3.2.3 SCAT Electronic Fare Collection

This phase implements an electronic fare collection system on all SCAT vehicles. Additionally, at the MVRTA terminal an automated system that "reads" information from each of the buses will be installed. The automated "reading" system will include laptop computers and infrared sensors that serve as probes.

The electronic fare collection system will record daily ridership activity including the number of passengers by route, time of day, by driver and by payment type. The information will be stored on-board the vehicle and downloaded on a daily basis. In addition to the increased level of detail on daily operations, the electronic fare collection system will result in a more convenient transit system for SCAT customers. The electronic fareboxes can accept dollar bills, automatically dispense time-stamped transfers and may be configured to accept magnetically encoded cards such as "smart" cards or debit cards. The electronic fareboxes could also be used to establish an automatic billing system for passengers.

Location: The technologies implemented in this project will include on-board as well as base station hardware. Base station equipment will be installed at the existing operations centers of the MVRTA and SCAT.

Technology: The automated collection of run time, passenger loading and mileage data will expand the on-board data storage and processing capabilities established with the AVL system installed under Project 3.1.

The electronic farebox technology will require an on-board processing unit that automatically counts coins, tokens, dollar bills and records transfers and other forms of payment. An electronic card reader for "smart' cards and small printer component for dispensing transfers is also required. An LED display will inform drivers on the status of passenger payment and provide information such as time of day.

The information will be stored on-board and down loaded to a.central computer system using "reading" devices such as infrared sensors or wired connections to the central computer.

Administration: It is recommended that Miami Valley Regional Transit Authority have overall responsibility for this project and assign staff to lead phases 3.2.1 and 3.2.3 - automated collection of data and electronic fareboxes for MVRTA. Springfield City Area Transit staff should lead phases 3.2.2 and 3.2.4 with assistance from MVRTA staff, Staff from the Miami Valley Regional Planning Commission are recommended to participate in all phases under this project to insure consistency. Additional coordination will be provided through the Traffic/Transit Management Work Group, as described in Section 9.0 of this report. Consulting assistance may be required at different points to assist staff with technical, administrative and management services.

Time Frame: This project will begin in year 2 with MVRTA installing an automated fare and data collection system and is expected to be completed in year 4. When the MVRTA system is installed, a similar system will be installed in the SCAT fleet, expected to begin in year 5. The electronic fare box system is recommended to begin with MVRTA installations in years 6- 10 followed by SCAT installations in years 1 l-20.

PROJECT: **3.3 - Regional Mobility Management**

Objective: This project implements a demonstration of the Regional Mobility Management concept - *an integrated, multi-provider approach to matching regional transit demand with available resources.* Deployment of this concept is expected to generate significant efficiencies and costs savings, improve the quality of transit service and result in service to more people. This project will utilize the AVL system established under Project 3.1.

Current Conditions: Currently, no examples of the mobility manager service concept are in operation in the Miami Valley, although aspects of this type of service have been considered as part of the Greene County Transit Study (Greene County Commission and Miami Valley Regional Planning Commission, 1996) and are being investigated for possible future implementation by the MVRTA.

Scope: 3.3.1 Mobility Management Demonstration

This project implements a consolidated, region wide (four county) system that will match transit trip demands with available resources. This consolidated trip matching system will be "invisible" to Miami Valley residents . To use the system, Miami Valley residents will call a single telephone number, provide their desired trip time, origin and destination, then receive a travel itinerary that reflects the most efficient manner to provide the desired service. This project will include a feasibility study and design phase to identify specific transit resources to be utilized and an operational strategy for combining them.

This project represents an extension and culmination of the coordination efforts implemented under projects 3.1,3.2,3.4 and 3.5.

Location: This project is recommended for implementation throughout the four county Miami Valley region although the phasing of the demonstration, as identified in the feasibility and design phases of the study, may recommend a geographically phased deployment.

Technology: The AVL system established under project 3.1 will be used for this project. Other technologies that support a Mobility Management operation vary widely but generally include an integrated telephone reservation system, integrated multi-provider electronic fare collection, same day trip requests and dynamic dispatching and transfer coordination. These technologies are implemented individually over time and across a number of agencies through other projects in Program Area 3.

Administration: It is recommended that Miami Valley Regional Planning Commission have overall responsibility for this project. Consulting assistance may be required at different points to assist staff with, technical, administrative and management services.

Time Frame: This project is scheduled to begin in years 6 - 10, after the initial AVL systems, electronic fare collection and data processing systems have been installed.

PROJECT: **3.4 -Transit Traveler Information**

Objective: To provide transit users with convenient, up-to-the minute information on the status of scheduled service. Information will be provided in a number of different ways including electronic displays at major MVRTA transfer locations/bus stops, on-board, automatic voice synthesized annunciators and on-board electronic signs that announce/display upcoming MVRTA transit stops and other helpful information.

Current Conditions: Currently, real-time transit information is not available in the Miami Valley. Static information, including route and schedule information is available through a number of means for most transit agencies, including customer service telephone lines (e.g., those of the MVRTA and SCAT); printed materials available through a number of outlets including on board vehicles, at transit information centers and at bus stops; and in-person assistance by staff at transit information centers.

Scope: This project is undertaken in four separate phases. Under two of the phases electronic message signs that display bus arrival time and other information will be installed at selected MVRTA and SCAT bus stops respectively. The two remaining phases will install on-board, automatic voice synthesized annunciators and electronic signs inside MVRTA and SCAT buses respectively. Following is a brief description of each phase.

3.4.1 MVRTA Electronic Station Displays

Electronic message signs that display bus arrival time and other information will be installed at selected MVRTA bus stops. The electronic message signs will provide projected bus arrival times based on the known locations of en-route vehicles. Vehicle location information will be generated through the AVL system implemented under Project 3.1. The electronic message displays will be mounted in a high visibility location at bus stops.

An important part of this phase is to select suitable MVRTA bus stops for installation of electronic message signs. Potential MVRTA locations include the following:

1. High-volume Miami Valley Regional Transit Authority (MVRTA) bus stops and/or key transfer locations. Potential candidates are the Downtown Transit Center and MVRTA's six new transit hubs now in various stages of design and construction.

2. MVRTA and other agency transfer locations not included under item 1 but which play a role in the recommended Flexible Transit Services Demonstration Project (Project 1.2)

3. High-volume Springfield City Area Transit (SCAT) bus stops and/or transfer locations.

3.4.2 SCAT Electronic Station Displays

This phase is similar to 3.4.1 except that electronic message signs will be installed at selected SCAT bus stops. This phase will be undertaken beginning in year **6.**

3.4.3 MVRTA On-Board Annunciators and Automatic Visual Information Signage

Under this phase an automatic voice announcement system and electronic displays will be installed in each vehicle in the MVRTA fleet. Activation of appropriate messages will be accomplished through the AVL system which will be deployed in Project 3.1. This project will be phased, starting with announcements and information relative to major transfer locations.

3.4.4 SCAT On-Board Annunciators and Automatic Visual Information Signage

This phase is similar to 3.4.3 except that an automatic voice announcement system and electronic displays will be installed in the SCAT fleet. This phase will be undertaken beginning in year 6 after installations in the MVRTA fleet are completed.

Location: This project impacts the two largest fixed-route bus operators within the Miami Valley, the MVRTA and SCAT. Project phases 3.4.1 and 3.4.2 will deploy electronic station displays at major bus stops/transfer locations and will include additional base station computer hardware and software at existing MVRTA and SCAT operations centers. Phases 3.4.3 and 3.4.4 will include implementation of on-board as well as base station equipment.

Technology: The AVL system deployed under Project 3.1 will be used to calculate the projected arrival time of each bus at its next stop. The projected arrival time will then be transmitted from the transit operations center to electronic displays at the appropriate bus stops.

There are several technology choices for the electronic displays including a changeable alphanumeric format such as LED or television style monitors, such as those used in airports.

Additional technology includes:

- a communications link between the individual signs and the transit operations center; and a

- a computer program, bus route database and geographic information system that calculates vehicle arrival times based on vehicle location data.

Administration: It is recommended that Miami Valley Regional Transit Authority have overall responsibility for this project. Consulting assistance may be required at different points to assist staff with, technical, administrative and management services.

Time Frame: This project is scheduled to begin in year 2 as the installation of the AVL system is being completed. Electronic signs will first be installed at high volume MVRTA bus stops, followed by the installation of on-board annunciators and message displays for the MVRTA fleet. Electronic signs, on-board annunciators and message displays for the SCAT fleet will commence in year 6, after the MVRTA fleet installations are complete.

PROJECT:	3.5 - Traffic Signal Priority Systems

Objective: To examine the feasibility of and develop a regional strategy for a transit vehicle traffic signal priority system. Traffic signal priority systems can improve bus travel times and on-time performance and help improve the attractiveness of transit as an alternative to single occupant vehicles.

Current Conditions: There are currently no transit traffic signal priority systems in place in the Miami Valley. Emergency vehicle signal preemption systems, which in some cases provide some of the capabilities required for some transit priority schemes, are widely deployed in the City of Springfield.

Scope: 3.5 Regional Transit Traffic Signal Priority Systems

This project will conduct a study to develop a regional strategy for transit vehicles and traffic signal priority. The study will also identify potential locations in the Miami Valley area for a traffic signal priority system involving transit vehicles. This project phase should be closely coordinated with the emergency vehicle preemption study recommended in project phase 2.2.1 (see Program Area2, Advanced Traffic Signal Control Systems).

Transit vehicles can be given priority at intersections when buses are running late or to help vehicles maintain their scheduled headways. Potential opportunities for priority treatments include the following:

- Routes where schedule adherence is consistently a problem for buses.
- Major arterials connecting major activity centers.
- Areas with a high volume of transit vehicle turn movements without a protected signal phase and/or turn movements into transit centers or other "off roadway" stops.
- Arterials with high bus volumes and short headways.
- Arterial/collector and major arterial/minor arterial intersections if the transit vehicle operates in the peak direction on the major street.

This project will be conducted within the context of a regional traffic signal policy and should be closely coordinated with regional traffic signal efforts. Deployment considerations need to include the following;

- Transit priority systems can negatively impact non-transit traffic operations, however, centralized traffic signal control systems with sophisticated algorithms can significantly reduce these adverse effects.

- Traffic signal systems are not owned or operated by transit agencies and any signal project would have to be implemented by the governing local traffic jurisdiction.

- Bus routes traverse multiple traffic jurisdictions and signal priority systems will have to be coordinated with multiple agencies.

Location: The transit priority strategies developed in this project are recommended for implementation at locations throughout the Miami Valley which satisfy the criteria utilized in the feasibility assessment. The types of locations which should be considered as potential candidates for transit priority treatments are outlined in the scope above.

Technology: Wireless communications between the bus and the traffic signal controller can be provided through various technologies including infrared sensors, detection via in-pavement or roadside devices. The AVL system implemented under Project 3.1 can be used to monitor real-time schedule status and automatically initiate priority treatments via a centralized traffic control system using cellular communication.

Administration: It is recommended that Miami Valley Regional Transit Authority have overall responsibility for this project. This project should be coordinated with regional traffic signal control efforts through the Transit/Traffic Management Work Group described in Section 9.0 of this report. Consulting assistance may be required at different points to assist staff with, technical, administrative and management services.

Time Frame: This project is scheduled to begin in years 6 - 10 with a feasibility study.

PROJECT: **3.6 - Coordination with Traffic Management and Traveler Information System(s)**

Objective: The purpose of this project is to establish linkages between interested transit agencies and traffic management and traveler informatin facilities.. Real-time traffic condition information can assist transit operators with managing headways, adhering to schedules and coordinating timed transfers. Traffic condition information will become even more important as flexible route deviation and general public demand responsive transit projects are deployed under Project 3.1, (3.1.3 & 3.1.4). Information relative to transit vehicle locations can be useful to traffic management personnel and a wide range of transit data, including static and real-time (vehicle location and schedule status information) information must be communicated from transit operators to the regional traveler information system central data server.

Current Conditions: Existing traffic management facilities consist of the traffic signal control rooms of the local jurisdictions of the Miami Valley that are responsible for traffic signal operations. There are currently no formal mechanisms for coordination between these facilities and transit operators. There is currently no regionwide system for assembling and disseminating multi agency transit traveler information.

Scope: 3.6.1 Regional Traffic Management and Traveler Information Systems Data Feeds

This project establishes a direct electronic data connection between transit agencies and traffic management and traveler information systems, including future freeway/incident management system control facilities (see Program Area 1, project 1.5) and the central data server for the regional traveler information system (Program Area 4, project 4.1). These linkages would permit interested transit agencies to receive traffic management surveillance data and would provide a direct electronic means for transferring transit schedules, vehicle locations and other data to the traveler information systems central data server. These linkages should be established in conjunction with the development of freeway detectionkurveillance capabilities (Project 1.1) and the central data server (Project 4.1).

Available data for transit agencies could include surveillance camera footage, highway advisory radio broadcasts and changeable message sign text. This data will compliment the information provided directly by transit vehicle operators in the field and will provide transit supervisors with a regional perspective on traffic conditions.

The extent of "connection" between the transit agencies and the traffic management and traveler information systems can be varied according to the needs, preferences and resources of particular agencies. Some agencies may opt for full "remote work station" type access to real-time data whereas others may choose to rely upon the same information sources which will be made available to the public (Internet, etc.).

Location: This project will implement communications connections between traffic control and traveler information facilities and the MVRTA and SCAT operations centers. As described in Program Area 1, project 1.5, a system of decentralized freeway/incident management system control facilities is recommended for at least the first five years, with aggregation of one or more facilities to be considered in the future. Given the recommended phasing of the deployment of the freeway/incident management system, which begins with I-75 from US 35 to I-675, the first connections will most likely be between the MVRTA operations center in Downtown Dayton and the municipal freeway/incident management control facilities of the City of Dayton, Montgomery County and the City of Vandalia. For traveler information purposes, linkages between all transit agencies should be established in conjunction with the development of the central data server of the traveler information system (Project 4.1).

Technology: A combination of telephone lines and fiber optic cable will be used for the communications between the transit agencies and traffic management system. Additionally, modems and a GIS based software program will be used to display the data.

Administration: It is recommended that Miami Valley Regional Transit Authority have overall responsibility for this project. Consulting assistance may be required at different points to assist staffwith, technical, administrative and management services.

Time Frame: This project is scheduled to begin in year 3, after the regional transportation management system is put in place.

PROGRAM AREA: 4 - MULTIMODAL TRAVELER INFORMATION SYSTEMS

DESCRIPTION: The goal of this program is to expand on the existing ITS traveler information services architecture to provide a comprehensive, integrated, multi-modal traveler tiormation system to serve the needs of travelers and operators in the Miami Valley Area.

Traveler information services have been identified as a priority at the Workshop Intensive held in January, 1997. The goal in providing multi-modal traveler information is to assist the users, or the traveling public, to make better, and more informed travel decisions based on real-time information regarding the surrounding transportation system and cm-rent roadway conditions. By providing travelers the ability to access real-time traffic information regarding travel speeds, accident/incident locations, and other information that may impede or slow their travel, they cm make better and more informed travel decisions. Users of this tiormation may decide to postpone a trip due to current traffic congestion or an active incident/accident. They may decide to take an alternate route to/from work based on the current roadway conditions or, they may decide to not make a trip at a particular time and delay their travel to a tune due to current weather or traffic conditions.

This user service provides a variety of traveler information including roadway conditions on speed, incidents, construction zones and delays, transit information, wide area travel information (airlines, Amtrak, buses), intermodal connections, weather conditions, and other travel related information.

Currently, the only traffic and travel information provided is through a few radio and television stations, making use of commercial traffic reporting services. The information provided by these sources, while useful, is often not complete and only provided periodically (during peak rush hours) and for a very brief period of time (maybe only one or two 30 second to one minute spots per hour). By providing multi-modal travel information through the mechanisms discussed below, travelers can get more detailed tiormation than is presently available, covering a wider geographical area than is currently possible, and can access this information when they want it, where they want it.

The three projects in this program area focus on:

1. Developing a central data server, which would collect data from various sources Pike traffic management components and transit components, process them and then disseminate them in different

formats and communication methods to various traveler information service components.

2. Providing selected technologies that would disseminate traveler information from the central data server to a wide audience of travelers and operators. Traveler information technologies include:

   - Expanded media reports from a central database system (most likely a PC-based system). From this one source, consistent incident and roadway reports can be provided to all area media (television, and radio) regarding highway conditions.

   - An automated telephone system which can be accessed by both land line phones and cellular phones. This system would provide updated information on roadway conditions on speed and incidents, construction activities, transit information, etc.

   - A cable TV system which will provide real-time traveler information to the public through a dedicated channel in their homes or at work.

   - An Internet service which will provide real-time and static information on roadway conditions, transit applications, and general information in the Miami Valley.

   - In-vehicle navigation systems in cars to provide real-time traffic information, route planning capabilities, and emergency Mayday facilities.

   - Kiosks that offer a wide variety of travel information at strategic locations like transit stations, malls, etc.

   - Alphanumeric pagers which receive information on specific roadway conditions during peak hours.

3. Pavement and weather sensing devices which provide critical weather condition information which can be disseminated through most of the above technologies and used by roadway maintenance crews to better plan and implement salting and plowing activities during adverse weather conditions.

RATIONALE: The program area supports all of the Overriding Factors that were developed for the Miami Valley ITS Early Deployment Plan:

- Region-Wide Perspective

- Safety
- Funding/Sponsor
- Serves Many
- High Visibility
- "Early Winner"
- User Acceptance
- Ease of Deployment
- Acceptable Risk-to-Benefit Ratio
- Maximizes Resources
- Acceptable Operating/Maintenance Costs
- Marketable
- Recognizes and Takes Advantage of the Unique Features of the Region

EXPECTED RESULTS:

This program area will directly address most of the problems identified during the development of the Miami Valley ITS Early Deployment Plan, including:

- Highway Congestion
- Highway Road Work and Weather
- Highway Travel Time
- Alternate Routes
- Route guidance
- Highway Special Events
- Highway Safety

4. MULTIMODAL TRAVELER INFORMATION SYSTEM	Implementation Timeframe						
	Year					Year 6-10	Year 11-20
	1	2	3	4	5		
4.1 Central Data Server	X	X	X	X	X	X	
4.2 Traveler Information Dissemination							
4.2.1 Media Reports	X	X					
4.2.2 Automated Telephone System	X	X					
4.2.3 Cable Television			X	X	X		
4.2.4 Internet	X	X					
4.2.5 In-vehicle Devices				X	X		
4.2.6 Kiosks				X	X		
4.2.7 Pagers	X	X					
4.3 Pavement and Weather Sensors							
4.3.1 Phase I Pavement and Weather Sensor System (I-75 from US 35 to I-70)		X	X				
4.3.2 Phase II Pavement and Weather Sensor System (I-75 from I-675 to US 40 and along I-70 from SR 48 to SR 201)				X			
4.3.3 Phase III Pavement and Weather Sensor System (Remainder of Freeway)					X		

PROJECT: 4.1- Centralized Data Server (CDS)

Objective: The objective of this project is to provide a centralized data repository for collecting traffic and travel data, storing and processing that data, and distributing the "information" out to dissemination devices such as cable television, kiosks, the Internet, pagers, etc., in the Miami Valley region. This system will be designed in an open environment so that future expansion of the data collection infrastructure or addition of more dissemination devices in the area can easily be incorporated into existing system.

It should be noted that although the technology for integrating a central data server with many sources of, and outlets for, traveler information is entirely feasible, such an integrated scheme requires significant institutional cooperation and coordination. The development of procedures and agreements relative to a central regional source of traveler information should be pursued as vigorously as the infrastructure components of such a system.

Scope: The CDS must be designed to interface with existing traffic management and traveler information infrastructure components. Also the system must be designed to easily expand to incorporate new dissemination devices as they are brought to the area. Development will be done in an iterative fashion, bringing systems "on line" in a time-phased manner to allow early distribution of available information. The system will be developed to incorporate all existing data sources throughout the region and provide an easy interface for new data collection systems to use as they become operational. Interfaces to systems like the media report process or the Internet web page could be brought on-line early while other information distribution systems are still under development.

The CDS will be required to handle multiple sources of communications, both from data providers as well as out to data dissemination devices. On the input side, data would be available via dedicated phone lines, dial-in reporting services, high-speed communication lines (1 ObaseT network and fiber optic) and manual input by operators. For output sources, the system must handle multiple sources of wireless communications, dial-up services, dedicated phone lines and Internet connections as well as having standard, published interface protocols that can be used by providers of dissemination devices to use in the development of their devices/systems.

The CDS should be located in a central location, designed to easily expand the communication and computing capabilities as additional input and output sources become available. Since there are no plans of a central traffic management center, the ideal location for the CDS could be a local control center. It does not necessarily have to be a specific local center, but could be any of the existing ones where communication links to the other centers and systems can be established fairly quickly and easily.

The CDS project must be one of the first, if not the first project implemented. While a few of the traveler information projects (possibly the Internet and media reports) could be implemented without making use of a centralized data source, all other traveler information projects are dependent on this CDS.

Figure 6-15 represents a high level architecture of the CDS with possible input interfaces and selected output interfaces. From the figure, it is reflected that the location of the CDS could be any local control center which already exists where communication links to the other areas can be established. This would facilitate the ease of exchange of information between various projects under program areas of freeway and incident management and traffic signal prioritization. The local control central would also establish easier links to data input sources like transit operations of MVRTA and SCAT, weather and pavement sensors, and general information in the Miami Valley.

Note: Details on the architecture and communication methodology is available in the system architecture working paper.

Location: It is recommended that the CDS be located in any of the existing local control centers in Miami Valley.

Technology: The CDS will be required to be operational 24 hours a day, and appropriate fail-safe technology will be needed to maintain this level of operational performance on a continuing basis. The CDS will use a combination of technologies like fiber optic, microwave, Internet, spread-spectrum radio, etc., appropriate to the functional performance requirements of each input and output source. The intent is to use existing technologies where possible in the initial phase and develop new systems as necessary and as resources permit. Output and input devices using cost effective methods like phone lines will be established first and higher capacity communication lines can be installed late.

Administration: It is recommended that MVRPC hire and supervise qualified consultants to participate in the planning, design and development of the CDS. MVRPC, working with input from the local municipalities, transit, and the State DOT, would identify the appropriate location where the CDS could be installed and operated. Though it is recommended that MVRPC oversee the planning, design, and development of the CDS, operation and maintenance of the CDS should be the responsibility of the agency where the CDS is physically installed. It is important that all agencies “buy in” to the concept of sharing data and providing this data to a central repository in order to facilitate the dissemination out to various traveler information devices.

Time Frame: The design and development of the central data server should begin in Year 1. Since this is an evolving development work, the design of this system will continue on till Year 6-l 0 with each system coming on-line based on priority and resources.

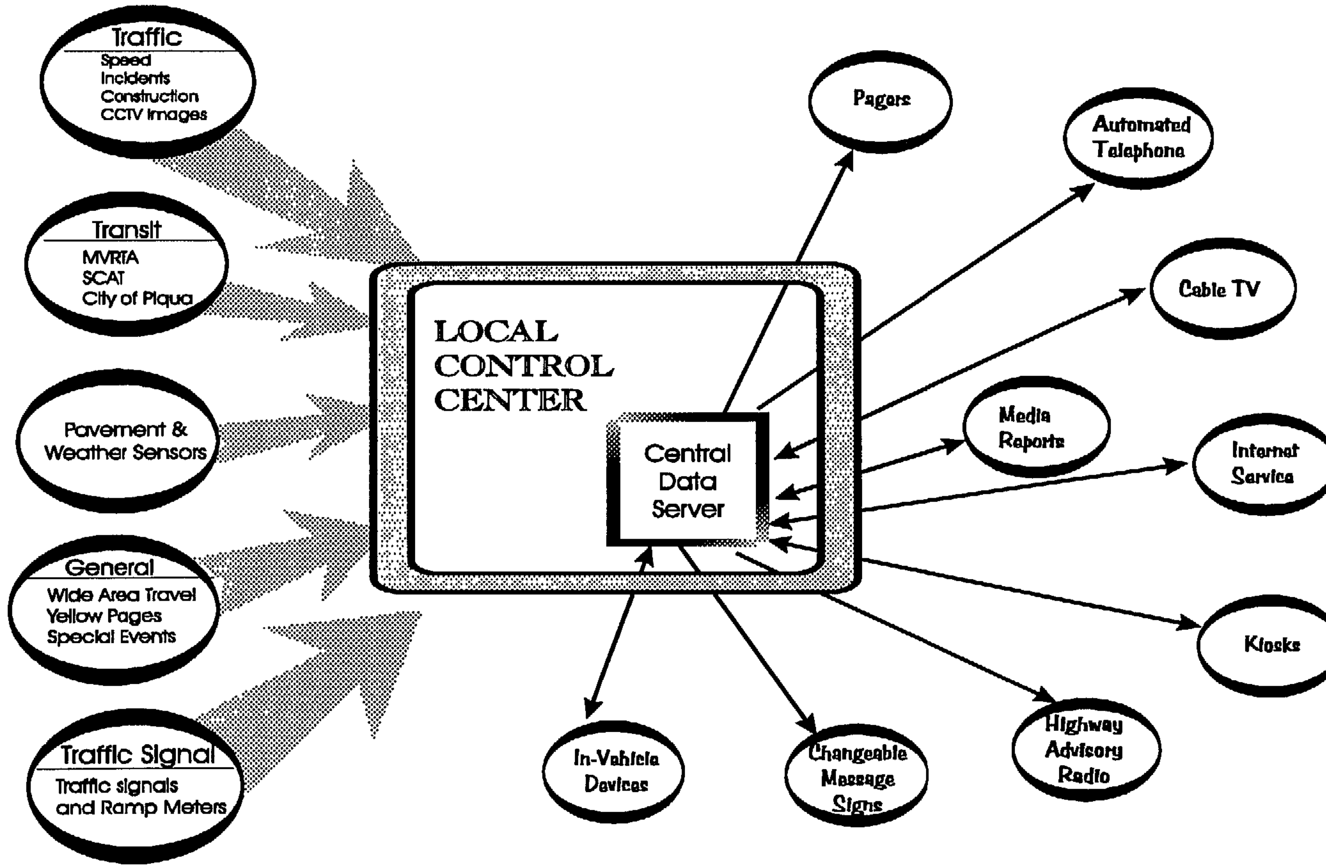

Figure 6-15
Central Data Server Inputs and Outputs

PROJECT: **4.2 - Multimodal Traveler Information Dissemination**

Objective:

The objective of this project is to deploy advanced multimodal traveler information services in the Miami Valley Area through a centralized data server located in a local control center. This center, while necessary, need not be a large, elaborate facility. It could be as simple as a single office or small operational area within an existing facility that can support the physical equipment and communication requirements necessary to talk to all the data collection and data dissemination devices. The central server will be responsible for processing the data and distributing it through the specified devices/systems to the travelers in the Miami Valley Area. Information that is disseminated will be available to all types of travelers to assist in pre-trip and/or en-route travel decisions. Communication links between the control center and the devices can be established quickly and cost-effectively. Once these services are in place and operational, they will be tested and evaluated both for their reliability and their ability to meet the public's needs for traveler information.

Note that Program Area 2, Freeway/Incident Management Systems, also includes traveler information projects like changeable message signs, highway advisory radios, and cellular hotline systems. These have been documented in Program Area 2 because they relate closely to the functions of freeway traffic management systems.

Current Conditions:

There are currently no real-time traveler information systems in the form of kiosks, cable television, Internet, navigation devices, or pagers. There are a few radio and television stations that provide some traffic information and reporting in the Miami Valley Area. The information provided by these media sources is gathered through private call-in services and commercial traffic reporting services and is typically only provided for brief reports, a few times an hour, during the peak rush-hour periods. In addition, there are a few commercial web sites that provide minimal traveler information such as CutyScapesTM and MapQuestTM. These sites provide users the ability to search map databases and receive. certain driving instructions (city-to-city, and some address-to-address) for the Miami Valley Area. In addition, Web sites are available for the University of Dayton, Wright State University, and many private companies and organizations within the Miami Valley Area

Currently, there is no central "source" for traffic incident and road condition (roadwork, travel advisories) information provided by the various public agencies in the Miami Valley region. There is no automated telephone system in the Miami valley, however, in Cincinnati, the

"SmarTraveler" system performs the same functions and provides very useful traveler information for Cincinnati and Kentucky residents.

Scope:

This project includes eight phases, devoted to an automated telephone system, media reports, cable television system, an Internet site, in-vehicle navigation systems, kiosks, pagers, and pavement and weather sensors.

4.2.1 Media Reports

This project phase provides a consistent means of disseminating real-time traveler information to the local radio and TV stations in the Miami Valley Area to benefit daily commuters and provide them with up to date information. While some traffic reporting is already taking place through independent, private reporting services, the goal of this project is to provide a central repository or source of traffic, travel, and road construction information in the Miami Valley Area. Television and radio markets already contain a large installed base capable of immediate distribution of improved traveler information. Broadcast TV and radio are limited in the extent of information that can be imparted on a 20-30 second traffic burst, but this provides the users the necessary information on specific accidents or congestion to avoid further delays for both pre-trip planning and also en-route. By centralizing this information source and providing a means for distributing this information on a real-time basis to all interested parties, this system will improve the accuracy, consistency, and amount of traveler information available to the traveling public.

This involves the processing of various roadway data already being collected through surveillance systems, public agencies, private call-ins and incident management teams, into a central database system (most likely a PC-based system). From this one source, consistent incident and roadway reports can be provided to all area media (television, radio, print) regarding highway conditions. Information available could include: date and time of specific report; incident location, time of incident, clearance times, and expected delay; speed data (free flowing, stop and go) on freeways, and major arterials; construction delays and times; maintenance activities (long term and short term); critical weather conditions (e.g. icy pavement, heavy rain, etc.); alternate route conditions; and major transit incidents.

Both the input and output communications needs could be handled via normal analog telephone lines. Input of incident and road condition information into the system would be via a dial-up modem where agencies or individuals (with appropriate clearance/ authorization) could remotely input incident, congestion, and/or road construction information that would be "stored" in the central database.

The output of information to the various media outlets could be done as a dial-in request or as an automatic broadcast. The most likely scenario would be to have this system serve much like a bulletin board system. Where the information on the bulletin board is maintained and kept up-to-date and available via a dial-up, modem connection. If distribution of information to unauthorized users is concern, access to the bulletin board could be easily limited through the use of passwords and user names.

As mentioned earlier, a second, more proactive approach, would be to "broadcast" this information to users or "subscribers." That is, when ever a "new" entry was added to the database or at a specified time (say every 15 minutes during the morning and evening commute periods), this would trigger the system to generate an "advisory" or report that would be provided to the media outlets. The mechanism for distributing these reports could be either a fax (hard copy) or electronic mail message. Incorporation of the electronic messaging capability would require inclusion of an Internet "service" that supported messaging capabilities. Certain information (like road construction information) could be disseminated periodically throughout the day (maybe 2-3 times daily) while incident and congestion information would be distributed on a real-time (as reported) basis.

Note: Details on the architecture and communication methodology is available in the system architecture working paper.

4.2.2 Automated Telephone System

This project describes the implementation of an automated telephone system to provide traveler information to the Miami Valley area from both land line and cellular phones. This system will provide travelers with up to the minute, route specific and on-demand information from anywhere, via the telephone. By using either pre-recorded, up-to-date traffic reports provided by operators or using computerized text-to-speech software (audiotext systems), users can make a phone call and through a series of menu choices, receive traffic and travel information for the areas of interest. This system is available to all income groups and does not have a cost barrier to use the technology and receive the information. The telephone has a huge installed base and is virtually in all homes and offices, and nearly 20-30% of vehicles (installed base in vehicles is expected to continue to grow). It has the advantages of being simple to use, provides pre-trip and en-route information and requires no training.

information collected on the freeways and major arterials needs to be integrated into a central location for data processing. Once the data is made available for dissemination is recorded into the telephone system with an update of the current conditions. An operator will have the capability of accessing specialized software to input current roadway conditions at certain intervals. System components include a central server to collect and process data; an audiotext system which runs specialized software to input current conditions manually (or a small audio recording booth for operators to periodically record travel messages); communication means, landlines and cellphone service to access the information; and a database to log in the calls coming in by type, time, etc. for future references

Information recorded on the system will be menu driven and provide specific route conditions on congestion, accidents, and any construction activities. This allows the user the flexibility of choosing the area of his/her concern without listening to a complete recording of the entire area. The system can also provide information on transit information and have an option to connect to the RTA's dispatch location, weather conditions, special event information, and other travel details.

The most important consideration in the communications area is the number of incoming lines that the system can handle at any time. The system should be designed to have the capacity to add additional lines for future enhancements.

Note: Details on the architecture and communication methodology is available in the system architecture working paper.

4.2.3 Cable TV

The objective of this project is to bring traveler information to the public in their homes through a dedicated traveler information cable TV channel. While similar in content to information currently available from radio and television stations, this system provides viewers with traffic information 24 hours a day. Viewers need not worry about missing the 20-30 second traffic spots on commercial television and radio stations. Information provided by the travel channel would include traffic congestion, travel speeds, accidents, construction and maintenance activities, and other special event information. The system will be designed to interface directly with the central data server to receive automated traffic and travel related information and generate the programming automatically, without human intervention. The system will also have the capability to manually "interrupt" the programming sequence (by pausing the programming) and allow the insertion of live, value added voice over.

This cable TV channel is similar to the weather channel in providing traveler information to the user, in their home or at work, at the time he/she needs it. The system will be designed to operate automatically with minimal operator assistance, but several features of the cable TV programming system can be adjusted and controlled by a human operator.

The system components of a Cable TV system include a central data server where traveler information is stored and processed for dissemination. This "source" of data could include travel speeds, accident/incident information (location, duration, severity), road construction information (location, duration, expected impact). In addition, where available, the cable television system would incorporate live video surveillance of the roadway.

Once the data is processed, the generation of programming occurs where an automated system (electronic producer) would access the data source, merge the traveler information, and generate the desired programming which would include graphics of real-time travel speeds, accident and incident locations, road construction, incorporation of live surveillance video (where available), and possibly a changeable textual "bulletin board" messaging system. The final step in the cable TV design includes the distribution of programming. This involves the selection of the location for the production system (the studio) to facilitate distribution to the cable television services. Co-location with, or possibly fiber optic connection to the local cable television providers will facilitate transport of the programming "signal" from the production facility into the cable television distribution system.

Once the program is ready, successful distribution of the cable television programming will be dependent on negotiating carriage agreements with either the local cable television providers or the public access channels.

The system will be designed to operate automatically without operator assistance. However, it will also have the capability for a human "operator" to interrupt or pause the programming, and provide live voice-over broadcasts (similar in content to those already provided on commercial radio stations). The most likely schedule of programming would be to use the live voice talent during peak travel times (7-9 a.m. and 4-6 p.m.) and to have the system operate automatically at all other times.

The exact communications and architecture requirements of this system will depend primarily on the location of the automated programming equipment (the studio). The most likely location for this equipment will be near the distribution locations of the cable television providers or the public access channels. A dedicated communications link between the "studio" and the data source would be needed to insure the production system was always working with the most recent, real-time data. Communication within the studio would be a connection of serial, video, and Ethernet connections (dependent on final design of the system). Connection from the studio to the cable system "head-end" or distribution point could be accomplished via fiber optic connections, or other high-capacity data communication links that would support full-motion video distribution. Once the programming is delivered to the cable television providers final distribution into the viewers homes is accomplished over the existing cable infrastructure.

Note: Details on the architecture and communication methodology is available in the system architecture working paper.

4.2.4 Internet

This project will provide residents with real-time traveler information on their computers at home or at work through access to the Internet. The project will take advantage of existing sources of travel related data such as transit schedules and routes, schedule of events, links to other Internet sources of information with data on or related to the Miami Valley region, and information provided by local convention or visitors bureaus.

This web page will provide users of the Internet access to the real-time traffic information collected in the region and provided by the central data server. The main components include:

- a data source or processing server, which contains relevant traffic data from the various surveillance assets, processes it and stores it for dissemination,

- a high-end personal computer that serves as the World Wide Web server. This machine interacts with the data source, retrieving real-time traffic information and video (snapshots and potentially full-motion video) and serves as the "host" for the Web page. All static information available on the local Web page would reside on this machine;

- an Internet Service Provider is necessary to provide the link between the Web server personal computer and the Internet.

As explained earlier, the Internet can provide a plethora of information to the users due to its capability. Some types of traveler information provided include real time traffic information on congestion, incident location, construction, maintenance, and road closures. This will be provided both in map and in text form. Overview and commute area maps can be provided. All this information will be acquired from the central data source and will be updated constantly. Live surveillance stills of cameras on the freeways can be shown on the page. These images are updated every l-5 minutes (depending on the number of cameras available) and it provides a visual image of the current traffic conditions at a particular location. A map showing camera locations with clickable icons will allow the user to access the desired images. The on-line services will have the capability of providing turn by turn route guidance (by car) when the user specifies an origin and a destination. The user can specify addresses or choose a specific point of interest from the database, request the route and detailed textual information will be returned almost instantaneously.

To assist in providing multimodal information, transit information on static bus schedules, maps, and key bus stops of the Miami Valley Regional Transit Authority (RTA) can be provided on the Internet system. This allows travelers to choose a different mode of travel and obtain detailed information on the transit system. For future planning, if the RTA develops a home page, a link can be established from the existing web page and users can receive updated transit information from RTA directly. Other types of information which can be static or links to the web pages which already exist are wide area travel information on greyhound, and Amtrak service where available, weather conditions and forecasts for the Miami Valley Area; airline schedule information on arrival and departure times from Dayton's airport, airport facilities like parking, baggage claim, etc; and tourism and recreation services around the Miami Valley like lodging, camping, historic sites, sports, etc.

The Web server can be physically located anywhere. The abilities of the Internet to "network" systems together provides near seamless connectivity to systems that are separated geographically. However, in order to incorporate the capability to capture the live surveillance videos, co-location with, or at least a high-speed data connection to, the central data source is necessary. For the input of data into the web server, a high-end data link is necessary for the Web server to interact with the CDS. In addition, a video input is needed with the capability to "switch" or rotate through the various video sources to gather the snapshot videos. The size of the output link to the Internet provider will depend on the anticipated traffic. Based on experiences in Atlanta and San Diego, a capability between a 56KB line and a partial T-l connection is Iikely to provide the necessary throughput to maintain a reasonable level of service for Internet users.

<u>Note</u>: Details on the architecture and communication methodology is available in the system architecture working paper.

4.2.5 In-Vehicle Navigation Systems

This project will provide travelers real-time traveler information through in-vehicle navigation systems installed in personal and commercial vehicles. Though navigation systems are still expensive for a common traveler, the market is growing and the number of products with useful functionality along with a reasonable cost is increasing. The highest concentration of installed navigation systems in the United States is found in the rental car market. The development of "standards" from "in&structure-to-vehicle" will make this technology more feasible and applicable for various cities all over the country. Navigation systems provide a multitude of functionality, but based on the area and the detail of information available, the type devices applicable may vary.

This project involves the development and dissemination of traveler information to an "off-the-shelf' navigation device, through wireless communications, installed in vehicles in the Miami Valley area. The information collected at a CDS is formatted and sent through a wireless communication media. The information received by the user should have functionality which would be useful for the driver to make smart decisions and keep the traveler well informed about current conditions. Functionality of the device will include traffic information (sent through wireless communications); route guidance (option available in the device); roadside assistance (for safety); intuitive user interface; directional and textual Messages; and yellow pages and other services.

The type of information available depends on the cost of the device, installation, maintenance, communication and the availability of real-time traveler information. A typical communications process for the in-vehicle device will interface with the CDS (either resident on the CDS or by using a separate personal computer as a "server" for this process) to retrieve the real time traffic, accident/incident, and road construction information. From there, the information will be broadcast to the in-vehicle units for display to the users through the in-vehicle unit's user interface. Depending on the device selected, the communications link between the central data server and the in-vehicle devices could either be a broadcast (one-way) type service (i.e., FM sub-carrier) or potentially a two-way wireless interactive service (cellular, CDPD, etc.) where the user requests travel information at a specific time.

Note: Details on the architecture and communication methodology is available in the system architecture working paper.

4.2.6 Kiosks

This project will provide relevant traveler information to daily commuters, visitors, transit users, pedestrians, and fleet operators through the deployment of state-of-the art touch screen traveler information kiosks. The system will serve as an information link to the traveler, providing real-time maps, incident, congestion, route planning, and transit schedule information. These kiosks can be placed at high mobility areas like airports, hotels, visitor centers, hospitals, and shopping centers.

Each kiosk will be a stand alone system with a touch screen monitor for easy interface and a printer which can print relevant information for the user. The stand-alone kiosks will interface back to a central kiosk server that will provide current real-time travel information such as travel speeds, accident/incident locations, and road work information. The number and placement of kiosks will be based on surveys and costs but should be located in high-traffic areas where people are likely to have short waits and willing to spend time (a few minutes) using the kiosks. Some examples would include the baggage claim areas of the airport, downtown office building main entries, shopping malls, traveler welcome centers on the interstate, and certain transit bus stops. The overall kiosk system includes both hardware and software design components. It is necessary to keep in mind system maintainability and operability throughout the design process. User interfaces are critical to system success since the major system users will be the untrained public. Major hardware system components include kiosk computer hardware, operator workstation, kiosk monitor, kiosk enclosure cabinet, a printer, telephone handset, speakers, etc.

Major software components include:

- a server software which receives real-time traffic data from the CDS. This software also allows map updates, and provides links to connect to the transit authority and to a central server for route planning purposes,
- a kiosk control system software which provides the capability of collecting, processing, and displaying information from the kiosks to the operator at the central location. It also allows data to be logged on the usage, maintenance, errors, and general failure information, and
- User-Interface Software which provides the user interface with the kiosk. This software should include multimedia tools and high-level graphics.

Information provided on the kiosk will include real time traffic information on congestion, incident location, construction, maintenance, and road closures. This will be provided both in map and in text form. The maps will have the capability of zooming in to view the area of interest to the user. All this information will be provided from a central operations server and will be updated in real-time to the individual kiosks.

Kiosks are frequently used to provide users multi-modal route and itinerary planning. For the short time frame, the kiosks will have the capability of providing turn by turn route guidance (driving guidance) when the user specifies an origin and a destination. The user will have the option of printing the directions using the printer, and details will include both maps and text for the specified route. Transit Information on static bus schedules, maps, and key bus stops of the RTA can be provided on the kiosk system. This allows travelers to choose a different mode of travel and obtain detailed information on the transit system. For future planning, once the RTA develops new transit applications such as a home page or automated itinerary planning, a link can be established from the kiosk to the web page or MVRPC and updated transit information can be obtained.

Other types of information which can be included in the kiosk are weather conditions and forecasts for the Miami valley area; airline schedule information on arrival and departure times from Dayton's airport, airport facilities like parking, baggage claim, etc; and tourism and recreation services around the Miami Valley like lodging, camping, historic sites, sports, etc.

Communications will be required to connect the kiosks at individual locations to the main kiosk server at the operations center. This can be established through high speed telephone circuits. The other communication is between the kiosk server and central data server where the traffic information, and route planning information are received from. This will likely be a high-speed data communications line between a 56KB line and a full or partial Tl line to the main control server network (depending on anticipated communications volumes).

<u>Note</u>: Details on the architecture and communication methodology is available in the system architecture working paper.

<u>4.2.7 Pagers</u>

This project will provide a means of disseminating real-time traveler information to daily commuters through alphanumeric pagers. Traveler information disseminated through this method can reach users throughout the region while they're en-route or before planning a certain trip.

Information collected in a central location from various data sources will be processed in a specific format based on priority. This data will be sent through a paging service (locally), to subscribers wanting the travel service. The information sent can be broadcast at time intervals or during morning and evening rush hours. Consideration should be given to number of messages sent at a particular time and also type of information sent so users are not overloaded with information to the point of ignoring it. Systems components include the CDS which collects, processes and disseminates data; communication methodology i.e. paging service, which obtains data from the CDS and acts as the medium to send information through the network, and users with alphanumeric pagers to receive information.

Information at a minimum could include date and time stamp of the message; travel times on major feeder routes; accident location and delay; and major construction, weather, or road conditions. Messages would be generated based on reported incidents/accidents through the central data server. The system generating the messages would be co-located with the central data server with a dedicated communication link (likely network connection). Distribution of the message to the paging service provider(s) would be through the use of a dial-up service already offered by most paging services providing alphanumeric capabilities. Broadcast of the messages to pager users would use existing infrastructure installed by the paging service providers.

Note: Details on the architecture and communication methodology is available in the system architecture working paper.

Location: Initial deployment of these traveler information systems will focus on the central Dayton area, expanding throughout the Miami Valley Area as data becomes available. The approach taken to implementing and administering these traveler information systems will have an impact on the physical location of the computer systems used to process and disseminate the information. If the systems are left to the private sector to implement and deploy, each system will likely be located at a different location. However, if MVRPC decides to fund the development of any or all of these systems, it would be appropriate for those systems to be co-located with the CDS.

Technology: The technology needed will be different for each traveler information device. In general, both high-speed (56KB or Tl lines, fiber optic) and wireless one- and two-way communications will be needed for the various systems. Some systems like the media reports, automated telephone system, cable television, Internet, and pages make use of existing infrastructure and a large installed base of devices (televisions, telephones, Pagers). Others like the in-vehicle devices and kiosks are newer technologies that do not have the large installed base yet.

Administration: Administration of the various traveler information systems will depend on the approach taken by the operating agencies in the Miami Valley Area. A trade-off must be evaluated between funding these systems with public sector funds or turning over the development and implementation to the private sector. If the public sector pays for the development and implementation of these systems, then they typically "own" the data and control the accuracy and use of the information. If the private sector invests heavily in these distribution systems, then ownership of the dissemination devices stays with the public sector and ownership of the data is a point of negotiation between the various entities. Some private sector companies would want complete and exclusive access to the data in order to justify their own capital investment in the system. The trade off is between high public sector investment resulting in ownership of the data versus low (or none) public sector investment and either loss of ownership or at least shared ownership of the data and dissemination mechanisms.

Time Frame: All of these systems could be implemented within the first five years. However, with the exception of limited functionality for the media reports, automated telephone system, and Internet, they all depend on the prior development and implementation of the Central Data Server described earlier.

PROJECT: **4.3 - Pavement and Weather Sensing Devices**

Objective: This project will provide daily commuters with information concerning the state of key roadways due to weather impacts. Pavement and weather sensor devices are already in use in cities around the country to assist in snow and ice removal operations. Using this information to inform the public of road conditions takes this concept one step farther.

Current Conditions: There are currently no roadway pavement/weather sensing stations in the Miami Valley. Conditions are known and predicted through field reports and weather services.

Scope: 4.3.1 Phase I PaVement and Weather-Sensing System: I-75(from US 35 to I-70

This project implements pavement and weather sensors along the central portion of I-75 from US 35 to I-70, the area identified as having the greatest congestion and safety problems.

By using state-of-the-art pavement and weather sensing equipment, general or specific pavement conditions such as ‘possible icy conditions ahead’ or ‘pavement temperature 30°F’ can be generated. The public can receive this information through a variety of platforms such as Kiosk, the media, cable TV, the Internet or changeable message signs. In addition, roadway maintenance crews can use current and forecasted pavement conditions gathered by this project to effectively clear ice and snow from roadways.

The main system components for developing a system of collecting and distributing pavement and weather information include in-road sensing devices, a processing unit to receive the data from the sensors and software to process this information into a format usable by the information distribution devices.

These devices come in two sections: Remote Processing Units (RPU) and remote sensing units. The RPU contains both pavement and weather sensing devices. The remote sensing units are additional pavement sensors located near the RPU. The RPU can gather the data from the remote sensing units via wireless communications. These two pieces can be networked in a variety of ways to monitor specific sections of roadway.

- The Central Processing Unit (CPU) is used to gather all the pavement and weather conditions from the RPU’s and remote sensing units.

- Software programs are available to process the data gathered. One example is a mapping program that can create a color-coded map of current or future road conditions. Other programs can combine the current state of the pavement with the current and future weather conditions, and produce a forecast of roadway conditions.

Pavement and weather sensor information can be distributed in a variety of platforms as mentioned before. Examples of types of information and the platform used include:

- Color coded maps of current and/or forecast road conditions such as wet/snow/ice/ dry. This information would be stored in the Central Data Server and accessed by all information distribution devices. Particular emphasis would be placed on providing this information to traveler information devices that can get the information to drivers on a real-time basis while they are in their vehicles, near the areas of concern. These include changeable message signs, highway advisory radio, in-vehicle, and media reports (radio and television broadcasts). While providing this information to other traveler information systems such as Kiosks, cable TV, or Internet platforms, would provide useful information, first priority should be given to those devices that interact directly with the driver in his/her vehicle.

- Road conditions could be displayed on changeable message signs.

- The media could report current and future roadway condition

- In addition, road maintenance authorities can use this information to forecast pavement condition and efficiently clear roads and highways during winter weather conditions.

Communication is required between the remote sensing units and the RPU, and the RPU's and the CPU. A variety of communication methods are available between this equipment. Examples include phone lines, cellular service, radio frequencies or fiber optic cable.

Note: Details on the architecture and communication methodology is available in the system architecture working paper.

<u>4.3.2 Phase II Pavement and Weather Sensing System: I-75 (from I-675 to US 40) and on I-70 (from SR 48 to SR 201)</u>

This second phase will expand the coverage of pavement and weather sensing devices to the remaining high-traffic freeway system within the Miami Valley Area.

4.3.3 Phase III Pavement and Weather Sensing System Remaining Freeway

This final stage will implement pavement and weather sensor devices on the remaining freeway system within the four-county Miami Valley Area.

Location: Implementation and installation of the pavement and weather sensors will be broken down in to three separate geographic project phases as described in the above scopes.

Technology: The technology implemented is a combination of in-road detection sensors for detecting potential icing conditions, pavement temperatures, and other above ground sensors for detection of fog. In addition, wireless communications are used to transmit data and information from the sensors to the RPU. Land-line communications are then used to transmit the data from the RPU back to a central facility or the CDS.

Administration: It is recommended that initially the Ohio Department of Transportation implement the installation of the pavement and weather sensor devices. Once the initial installation and operations are completed, continued operation and maintenance of the system could be turned over to the local municipalities or potentially the MVRPC.

Time Frame: It is recommended that these systems be installed in the short-term period between years 3-5 with a phased implementation as described earlier.

PROGRAM AREA: 5 - PUBLIC-PRIVATE PARTNERSHIPS

DESCRIPTION: This program area does not contain "projects" in the same sense that Program Areas 1 through 4 do. Rather, the "projects" described in this program area refer to either recommended processes/procedures or to specific *partnership opportunities* which are not projects themselves but which relate to specific projects described in Program Areas 1 through 4.

For example, the area of "freeway service patrols" is identified here as an opportunity for public/private partnership (Project 5.2). This partnership would in fact be pursued in the course of developing Project 1.1.1. (Service Patrols). In this way, the "projects" described in this section should be viewed as recommendations. These recommendations have been presented as "'projects" in order to insure their visibility in the plan and to underscore the significance of partnering in the deployment of the recommended ITS system.

Successful introduction of ITS services relies on private as well as public commitments. This program area describes opportunities for educating and actively involving the private sector directly in Miami Valley ITS service initiatives. Awareness and support of ITS services must be developed in both sectors for ITS initiatives to reach their full potential. Public-private partnerships can include a range of activities, such as "design/build" project implementation, system operation and maintenance, and sharing facilities.

As relationships develop and partnerships form, many important issues need to be considered including ownership, oversight, use of labor, financing, etc. Specific legal and procurement issues may need to be addressed including:

- Statutory authority.
- Means of procuring equipment and software (e.g. competitive bidding or sole source of supply).
- Partnership agreements and purchase orders.
- Property rights and ownership of documents.
- Intellectual property indemnification.
- Patents.
- copyright.
- Audit procedures.
- Confidentiality.
- Liability.
- License agreements.

The Miami Valley ITS Strategic Deployment Plan recognizes the potential for the private sector to develop creative, mutually beneficial approaches to meeting the identified transportation needs in the Miami Valley area.

This program area includes two specific projects designed to promote and develop private sector understanding and support for the regional ITS deployment and to utilize the private sector to share funding responsibilities in specific projects. These projects consist of an Open Initiative and Request for Partnership Proposals process to develop specific partnership arrangements and an ongoing outreach and education effort.

This program area also identifies a number of specific partnership areas which hold high potential and which should be pursued in conjunction with the development of projects in other Program Areas.

RATIONALE: The program area has the potential to support all overriding factors and many of the transportation problems in the Miami Valley area.

EXPECTED RESULTS: This program area is expected to lead to an increased awareness of ITS initiatives along with opportunities to secure private funding to further ITS deployment in the Miami Valley area.

5. PUBLIC-PRIVATE PARTNERSHIPS	**Implementation Timeframe**						
	Year					**Year 6-10**	**Year 11-20**
	1	**2**	**3**	**4**	**5**		
5.1 Open Initiatives and Requests for Partnership Proposals	X	X	X	X	X	X	X
5.2 Freeway Service Patrols		X	X	X	X	X	X
5.3 Traveler Information System		X	X	X	X	X	X
5.4 Cellular Phone Incident Detection/Travel Information			X	X	X	X	X
5.5 Right-of-Way Installations		X	X	X	X	X	X
5.6 Adopt-A-Device Program		X	X	X	X	X	X
5.7 Public-Private Partnership Outreach	X	X	X	X	X	X	X

PROJECT: **5.1 Open Initiatives and Requests for Partnership Proposals**

Description: This project promotes private sector participation in the Miami Valley ITS deployment by providing two mechanisms for potential private sector partners to submit proposals for projects which advance the objectives of the Strategic Deployment Plan and which may not appear in the plan. The first mechanism, Open Initiatives, consists of a standing invitation to submit private/public partnership proposals. A standard, relatively general set of proposal criteria will be established and disseminated. Interested partners may then submit proposals at any time until the program is canceled or until proposal criteria are revised. The second mechanism, Requests for Partnership Proposals (RFPP), consists of the periodic issuance of requests for specific project partnership proposals.

Scope and Partnership Agreement: The nature of the partnership will vary but in all cases will be consistent with established criteria and will advance the objectives of the Strategic Deployment Plan.

Time Frame: This project can begin immediately and is expected to continue indefinitely.

Partnership Benefits: Generally, by allowing private sector partners to develop their own partnership proposals, "realistic" partnerships with committed private sector interests can be identified, often a more efficient process then attempting to construct a partnership that it is hoped will attract private interest. By allowing potential private partners to make unsolicitated proposals, the possibility that significant partnership opportunities will be missed, due to failure to include specific projects in the Strategic Deployment Plan or failure to issue a specific RFPP is greatly reduced. Utilization of specific FRPP's allows some control over the timing of proposals and provides additional opportunities to narrow the scope of the proposals while still allowing the private partners to structure the specific arrangement.

PROJECT: **5.2 - Freeway Service Patrols**

Description: This project would consist of a partnership between ODOT and/or the MVRPC with a private operator of freeway service patrols. Similar to the arrangement in Cincinnati, the operating costs of the program would be split roughly 50/50 The privately funded portion of the service would be underwritten by commercial sponsors, as is currently the case with the Samaritania patrols now operating on a limited basis in the Dayton area.

Scope and Partnership Agreement: Additional service patrols will coincide with the implementation of service patrols under Project 1.l in Program Area 1. Items to consider in partnership agreements include operating schedules, personnel, communications, and services offered.

Time Frame: This project will be coordinated with the development of service patrols under Phase 1.1.1 of Project 1.1 that is scheduled for years l-5.

Partnership Benefits: Benefits to the Miami Valley area include additional highway service patrol coverage at a reduced cost. Benefits to the private partners include recognition, publicity and goodwill within the community.

PROJECT: **5.3 - Traveler Information Service**

Description: This initiative is linked to projects in Program Area 4 - Multimodal Traveler Information System. There are several possible variations to this project, but generally the public sector would build an infrastructure for collecting and distributing basic information on traffic conditions. This information would be used by the public sector to manage the transportation system and also provided to the private sector for a fee. Private enterprises such as SmartRoute Systems and Metro Networks would purchase the information, add to it, then reformat it for distribution to the public. Potential ways for the private sector to distribute the information include a cable television channel, and providing information to radio and television programs.

Scope and Partnership Agreement: Coordination efforts will include procedures to ensure consistency in the information provided and provision of electronic links between the public and private sector. Partnership agreements should address how the information will be used, updated and stored.

Time Frame: A solicitation for partnerships should be made within six months of when the infrastructure is in place and information is available for use. The time frame will be tied to Project 4.1 - development of a central data server.

Partnership Benefits: Fees from the private sector will help the public sector finance traffic surveillance and detection systems along with other components of an overall traffic management system. The private sector will gain valuable information that will allow them to sell their services to various businesses. It is also expected that the general public will have greater access to more comprehensive information on travel conditions that will allow them to make informed choices for their travel plans.

PROJECT: **5.4 - Cellular Telephone Hotline for Freeway Incident Detention and Travel Information**

Description: This project consists of establishing a partnership with a cellular phone company to operate a freeway traffic incident telephone hotline reporting system. This system would include a dedicated number (e.g. *999) for the reporting of non-emergency freeway incidents. This program would be managed by ODOT, who would operate a central dispatch center and have response plans prepared in advance for incidents. The role of the cellular phone company would be to provide the phone calls free of charge to their customers.

The development of this project should be closely coordinated with Projects 1.1.8 and 1.1.9, which implement enhanced reference markers. Experience with hot lines has indicated that the accuracy, and therefore the benefit, of the information that is reported is significantly improved with the addition of enhanced roadway marking, which provides more frequent and more detailed information to motorists about where they are. Lack of precision and/or incorrect location information from callers is currently a problem for most 911 systems and the introduction of a new reporting system like a hotline will only increase the volume of inaccurate and unusable information if not accompanied by enhanced roadway marking.

Although the partnership aspect of this hotline project deals only with cellular telephone calls, it should be noted that the State of Ohio is currently participating in national efforts to establish "N11" hotline programs (the "N" would be replaced by a different digit in different regions across the country) that would apply to all types of phone calls. This project should coordinate with that effort as appropriate.

Scope and Partnership Agreement: An initial inventory of current cellular telephone systems should be performed by a consultant and a process for soliciting and selecting a cellular telephone provider(s) established.

Time Frame: Solicitation for partnerships should be tied to the progress of phase 1.1.4 of Project 1.1 - Implementing a Cellular Hotline System. This phase is earmarked as a short term initiative, years 3-5.

Partnership Benefits: One benefit of this proposed program is that it provides an alternative to the "9 11" number that is intended for emergencies but can be overwhelmed by multiple cellular phone calls regarding traffic incidents that either do not require emergency services or have been previously reported.

The incentive for the cellular phone company is two-fold; they receive a public relations benefit and, according to companies participating in similar programs, they feel that initiatives like this promote the use of cellular telephones.

PROJECT: **5.5 - Right-of-Way Installations**

Description: Under this project, private companies would be granted access to public right-of-ways for the purpose of installing items such as fiber optic cable, cellular telephone towers, etc. In return for granting access to right-of-ways, the public sector could receive payment of fees, antenna use, travel time data (from cellular providers) and/or use of fiber optic cable.

There is a precedent for such partnerships in Ohio. The Ohio Department of Transportation has established an agreement with Air-touch Cellular, AT&T Wireless Services and GTE Mobile Net which allows these companies to construct cellular communications towers within ODOT right-of-way in exchange for cash payments and state use of the towers. The agreement solves the problems associated with siting of towers, which are opposed by many neighborhoods, and provides ODOT with cash (between $8,000 and $22,000 per site) and reduced costs for their own communications infrastructure (ODOT will save $25 million when antennas for a new statewide radio system are added to the cell towers). This new program is currently being tested, with ten sites selected and construction proceeding in some locations.

Scope and Partnership Agreement: An inventory of potential right-of-way sites and identification of potential private sector installations will need to be conducted. Partnership agreements should address items such as installation specifications, site access, necessary permits, maintenance, and compensation. Legal and institutional regulations will need to be explored to determine if barriers exist for private sector access to public right-of-way.

Time Frame: Opportunities for access to public right-of-ways will be tied closely to the progress of projects in Program Areas 1: Freeway Incident Management Projects and 2: Advanced Traffic Signal Control Projects. Time frames for projects in these program areas range from immediate (years l-2) to long-term (years 1l-20).

Partnership Benefits: Depending on the type of partnership, the public sector could benefit by receiving additional funding (fees) to be used towards ITS deployment and/or free or low cost use of equipment that they otherwise would purchase and install. This type of arrangement would have the effect of providing additional ITS services and components with little or no additional public funding.

The private sector would benefit by having access to sites that are vital to delivering their services and could gain a competitive advantage over their competition.

PROJECT: **5.6 - Adopt-A-Device Program**

Description: This project involves the private sector sponsoring or adopting ITS devices such as changeable message signs and kiosks. Generally, under this program, a company would pay a fee and in turn the company would receive recognition/publicity associated with the device - e.g. the company's corporate logo would appear on a changeable message sign.

Scope and Partnership Agreement: Partnership agreements would address items such as responsibility for operations, maintenance, information display, along with appearance, placement and use of corporate images. Legal and institutional regulations will need to be explored to determine if barriers exist to private sector sponsorship.

Time Frame: Opportunities for corporate sponsorships will be tied to the development of the following projects:

1.2 Traveler Information
1.4 Enhanced Incident Management Program
3.4 Transit Traveler Information
4.2 Traveler Information Dissemination

Time frames for these projects range from immediate (years l-2) to long-term (years 1l-20).

Partnership Benefits: The public sector could benefit by receiving additional funding (fees) to be used towards ITS deployment. This arrangement would have the effect of providing additional ITS services and components with little or no additional public funding.

The private sector benefits by promoting their company and/or products to a large market in a unique way.

PROJECT: **5.7 - Public-Private Partnership Outreach**

Description: The purpose of this project is to make the private sector aware of Miami Valley ITS initiatives and stimulate private sector involvement in ITS service development and deployment. This will be accomplished through a regular forum for representatives from the private and public sectors. This project will also research techniques, procedures, agreements and legislation related to public/private partnerships

Scope and Partnership Responsibilities: The ITS Ohio chapter could play a lead role in organizing and providing ongoing guidance to this project. ITS Ohio would work with other groups in the area, such as the Miami Valley Regional Planning Commission, metropolitan agencies and ODOT-ITS working groups that have shown a significant amount of interest in ITS initiatives.

Time Frame: This project would commence soon after the Strategic Deployment Plan Deployment Committee is formed (Project 6.1) and continue throughout the duration of ITS deployment in the Miami Valley area.

Partnership Benefits: Benefits include an established forum for representatives from the private and public sectors to meet and discuss items of mutual interest. It is expected that this ongoing communications and educational exchange will also result in a better understanding of ITS projects and a greater likelihood of the private sector supporting ITS initiatives in the Miami Valley area.

PROGRAM AREA: 6 - TECHNICAL AND PLANNING SUPPORT

DESCRIPTION

This program area consists of support services for the deployment of ITS projects in the Miami Valley area as follows:

ITS Deployment - It is recommended at a Deployment Committee be formed to coordinate and facilitate the implementation of the Miami Valley ITS Strategic Deployment Plan. Members of the current ITS Policy and Technical committees are recommended to serve on the Strategic Deployment Plan Deployment Committee. This new committee should at least be represented by agencies from the Miami Valley Regional Planning Commission, the Ohio Department of Transportation, and other governmental jurisdictions within the Miami Valley area. Services will be needed to support the formation, administration, and activities of the Deployment Committee and technical sub-committees including decision support, project workshops, data collection, and meeting facilitation.

Technical Support - Management, administrative and technical services will be needed to support the Deployment Committee in the development of projects and providing technical coordination, evaluation, and management of various projects in the Miami Valley area. Initial efforts will focus on developing detailed project plans including reviews of relevant and existing plans, -systems, standards, specifications, and guidelines. Guidance will also be provided in coordinating the Miami Valley ITS program with local, state, and national efforts and plans. Recommendations will be developed for joint working relationships, and private sector initiatives and responsibilities. Additionally, ITS Ohio could play an important role in the coordination and establishment of standards and guidelines.

Outreach and Public Education -Outreach and public education programs will be developed and conducted that focus on ITS services with an emphasis on benefits such as increased efficiency and safety. Management, administrative and technical services will be utilized for workshops, meetings, public forums, and newsletters. The purpose of this program area is to build public support for ITS services.

It is expected that this program area will be supported through a combination of the ITS Ohio chapter and other groups in the Miami Valley area which have shown interest in ITS initiatives. This support will be augmented by consultant services. The need for outside services will be reviewed annually and balanced against the ITS program and internal staff requirements.

RATIONALE: This program area supports the following Overriding Factors:

- Reflects a Region-Wide Perspective
- Serves Many
- High Visibility
- Maximizes Resources
- Accepted by Users
- Acceptable Risk-to-Benefit Ratio
- Ease of Deployment
- Marketable

EXPECTED RESULTS: This program area will address the following Problem Areas:

- Cooperation and Coordination
- Funding
- Legal/Institutional

The coordination provided through this program area will support most of the User Services.

6. TECHNICAL AND PLANNING SUPPORT	**Implementation Timeframe**						
	Year					**Year 6-10**	**Year 11-20**
	1	**2**	**3**	**4**	**5**		
6.1 Strategic Deployment Plan Deployment Committee							
6.1.1 Assist with Formation of Committee and Subcommittees. Provide Initial Organizational Support in Implementing Program Plan.	X	X					
6.1.2 Committee Administration and Coordination Service	X	X	X	X	X	X	X
6.1.3 Decision Support Services	X	X	X	X	X	X	X
6.2 Technical Support							
6.2.1 Develop Project Plans, Solicitations, and Evaluations	X	X	X	X	X	X	X
6.2.2 Lead Projects at the Direction of the Deployment Committees	X	X	X	X	X	X	X
6.2.3 Coordinate Miami Valley Plan with Local, State, and National Plans	X	X	X	X	X	X	X
6.3 Outreach Education							
6.3.1 Public Information Center	X	X	X	X	X	X	X
6.3.2 Public Outreach and Education	X	X	X	X	X	X	X
6.3.3 Internal Education and Interagency Involvement	X	X	X	X	X	X	X

PROJECT: **6.1- Deployment Committee**

Objective: Support the establishment of a Deployment Committee and technical subcommittees and provide ongoing administrative support to these committees.

Current Conditions: The Miami Valley ITS Strategic Deployment Plan was developed by the Miami Valley Regional Planning Commission in cooperation with the Ohio Department of Transportation and other regional transportation agencies. Two committees guided this effort:

- The Policy Committee that provided overall direction.
- The Technical Committee that provided technical direction.

Scope: This project involves the estabhshment of a Deployment Committee and technical subcommittees, administrative support for the committees, and the decision support for project lead agencies.

This project is divided into the following phases:

6.1.1 Initial Committee Development

It is recommended that a Deployment Committee and technical subcommittees be formed from the current Policy and Technical Committees. The Deployment Committee will oversee ITS deployment in a consistent and integrated manner and ensure that the plan is maintained and updated as necessary. The technical subcommittees or working groups will oversee specific projects conducted under the Strategic Deployment Plan.

This phase will support the creation of the committee structure including: developing a comprehensive plan for the operation, authority, responsibilities of each committee; identifying and securing representation on the committees by appropriate individuals and agencies; leading the development of organization goals and objectives for each committee; and identifying the initial plans for the committee operations.

6.1.2 Administrative and Coordination Support

This phase will provide support to the general operations of the ITS committees. This will include coordination, facilitation and documentation of committee meetings, financial tracking of Miami Valley ITS projects, correspondence support for internal activities, and providing a central contact for Miami Valley Strategic Deployment Plan organizational information.

6.1.3 Decision Support

As the Miami Valley Strategic Deployment Plan evolves and becomes a mature program, an ongoing decision support process will be necessary to determine project priorities and funding levels. A central element of this decision support is the gathering and analysis of relevant project information. A framework is needed to analyze the costs, benefits, impacts and other issues of ITS projects in a common manner such that relative merits of projects can be viewed in an objective manner.

This phase provides support services to individual projects and lead agencies to help justify project funding. It establishes a framework to perform cost-benefit impact and other analysis needed to justify Miami Valley area ITS projects. It also provides staff support to perform analysis functions. Included will be the collection of data from relevant sources to support the analysis process.

Location: The Deployment Committee and technical subcommittees will represent transportation agencies and interests throughout the Miami Valley area.

Technology: General purpose office automation technology will be used to support the Deployment Committee and technical subcommittees.

Administration: It is recommended that a contract for outside consulting services be administered by a lead agency. This lead agency will receive proportional funding for the contract from supporting agencies. The lead agency should commit the necessary resources to develop, monitor and administer the consultant contract.

Time Frame: Ongoing from project start. Annual review to determine level of support needed and use of consultant services versus internal staff.

PROJECT: **6.2 - Technical Support**

Objective: Provide the Deployment Committee and technical sub-committees with technical services and project management support for Miami Valley area ITS projects.

Current Conditions: Technical support is currently being provided to the Miami Valley ITS Policy and Technical Committees.

Scope: This project involves providing technical project management support to the Deployment Committee and technical subcommittees. This project is divided into the following phases:

6.2.1 Develop Project Plans. Solicitations. Evaluations

The Strategic Deployment Plan will establish the core elements of proj ects to be funded with local, state and federal funds. From these core elements, project plans and solicitations for consultants and contractors will be developed. The lead agencies for the projects will determine the project management needs for each project and the resources to develop and manage the projects. This phase provides ongoing support to the lead agencies for finalizing project definitions, developing project solicitations, selecting suppliers, and evaluating projects and results achieved. It is expected that when consultants are involved in project development and evaluations, they will be excluded from supplying the requested project services.

6.2.2 Lead Projects at the Direction of the Deployment Committee

This phase provides project management for those Miami Valley ITS Strategic Deployment Plan projects not managed by participating agencies. Project management activities will include:

- Developing scope of work, schedule and budget with contractor.
- Providing technical leadership for project activities.
- Ensuring project meets objectives, budget and schedule.
- Providing liaison with appropriate Miami Valley area ITS interests.
- Managing administrative functions.

6.2.3 Coordinate and Update Miami Valley Strategic Deployment Plan as Necessary with Subregional Regional. and National Plans

The Miami Valley ITS Strategic Deployment Plan is a “living” document that needs to be updated on an annual basis to reflect changes in local, regional and national ITS plans, opportunities and needs. The sub-project will monitor Miami Valley ITS projects and other local and state ITS initiatives and track their compatibility with each other and national ITS initiatives and architectures. It will also support an annual update to the Strategic Deployment Plan including a process to review past plans, current status and needs, and a review and update of program area priorities and project funding.

Location: Area wide.

Technology: General purpose office automation technology will be used to provide technical support.

Administration: It is recommended that a contract for outside consulting services be administered by a lead agency. The lead agency will receive proportional funds for the contract from supporting agencies. The technical support contract is initially expected to be a two-year contract with options for extension in two-year increments. This will allow the support consultant to dedicate adequate resources to the project and establish a project office.

Miami Valley area agencies will request services from the technical support consultant on an as-needed basis. Each requesting agency should supply a liaison to the technical support consultant to coordinate issues. An oversight committee will also be needed.

Time Frame: Initial two-year contract and a minimum of a second two-year contract.

PROJECT: **6.3 - Outreach/Education**

Objective: Build private and public awareness and support for ITS services and benefits.

Current Conditions: Outreach programs have been used to educate a variety of transportation interests throughout the Miami Valley area. The Policy and Technical Committees have held a series of individual meetings to conduct workshops and prepared newsletters to keep the public apprised of Strategic Deployment Plan developments. Two outreach workshops were held to educate and gather stakeholder feedback, and three newsletters have been published.

Scope: The introduction of ITS services will be through a combination of public and private initiatives. Awareness and support of ITS services must be developed in both sectors to allow ITS initiatives to reach their full potential. In the public sector, local, state and national political representatives should be educated on ITS services and their benefits to transportation and the general public. This education will allow legislators to make informed funding decisions when proposals are presented for ITS initiatives. Public agency officials need to be educated on ITS services and plans for ITS in the Miami Valley area so that they can consider these services and plans when they make planning and tiding decisions. Finally, the general public needs to be made aware of ITS initiatives so they can voice their support to their representatives and be educated on the use of ITS services to improve their traveling experience.

In the private sector, service providers, equipment manufacturers and system developers need to be made aware of potential partnerships on all Miami Valley ITS projects. Forums are one way to bring the private and public sectors together to discuss private sector involvement in deployment of ITS in the Miami Valley area.

This project is divided into the following phases:

6.3.1 Program Information Center

A Program Information Center (PIC) will provide a centralized source of information on Miami Valley area projects and activities. The PIC will serve as the official “voice” of ITS Deployment in the Miami Valley area, the PIC will publish a regular newsletter and press releases. It will also develop special communications materials such as brochures, displays, and media communication pieces as necessary throughout the life of Miami Valley ITS initiatives. Finally, the PIC will serve as a central source for all inquiries on Miami Valley area ITS activities and will be handled directly or forwarded to the appropriate agency.

6.3.2 Public Outreach and Education

This phase focuses initially on providing local and state political representatives with information on ITS services and benefits. Forums and workshops will be conducted throughout the region to inform legislators on issues such as Miami Valley area ITS projects, future plans, private initiatives, benefits from existing local systems and national operational tests. The general traveling public will also be educated on these issues as projects near operation and funding requests are submitted.

6.3.3 Internal Education and Interagency Involvement Program

This phase focuses on educating public agency officials on the use of ITS services and the status of Miami Valley ITS projects. Classes and workshops will be held in the Miami Valley area on a regular basis to provide this education. Training would be directed at planners, design engineers, department leaders and others likely to be involved with ITS services. A regular forum will also be established to discuss the use of ITS services and an exchange of ideas, practices and operating issues associated with ITS services. This training would cover technicians, system operators, and operation managers from ITS agencies throughout the Miami Valley area.

Location: Area wide.

Technology: General purpose office automation technology will be used to provide technical support.

Administration: A significant amount of interest in ITS initiatives has been shown by groups within the Miami Valley area such as the Miami Valley Regional Planning Commission, the Miami Valley Regional Transit Authority and the Ohio Department of Transportation. With the exception of the Program Information Center, these groups will provide the majority of initial support for this project. They will be given a small amount of staff support within this project in areas such as meeting coordination and consultant resources for material development.

Time Frame: Initial two-year contract and a minimum of a second two-year contract.