Oregon Department of Transportation

PORTLAND REGIONWIDE ADVANCED TRAFFIC MANAGEMENT SYSTEM PLAN

F i n a l R e p o r t
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in association with

IBI
Group

101598

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INTRODUCTION

The Portland Regional Transportation Plan' indicates that by the year 2010, $5 billion dollars will be spent on transportation, and the region will have even more congestion on major corridors than today. The Portland region cannot rid itself of congestion by simply building new transportation infrastructure. A coordinated, systematic approach will be necessary to effectively manage the region's transportation infrastructure as the region develops a multi-modal transportation system. We will need to develop methods of getting the most out of the infrastructure already in place. By working efficiently and cooperatively among agencies, we can build and manage a smarter transportation system using Intelligent Vehicle Highway Systems (IVHS).

IVHS is the application of new technologies with proven management techniques to reduce congestion, increase safety, reduce fuel consumption and improve air quality. By definition, IVHS includes Advanced Traffic Management Systems (ATMS), Advanced Traffic Information Systems ATIS, Commercial Vehicle Operation (CVO), Advanced Vehicle Control Systems (AVCS) and Advanced Public Transit System (APTS). ATMS is the basic building block of IVHS. All other functional areas will utilize the information provided by ATMS. This project focuses on ATMS, and incorporates applications of ATIS, CVO and APTS. ATMS integrates management of various roadway functions, including freeway ramp metering and arterial signal control. ATMS can be used to collect, process, and disseminate real-time data on congestion within corridors and to alert automobiles, commercial vehicles and transit operators of alternative routes. Rapid detection and response to traffic incidents can be especially effective in reducing corridor congestion. Dynamic traffic control systems will respond to changing traffic conditions across different jurisdictions and types of roads, routing drivers around delays where possible.

An ATMS master plan is an integral component in achieving the goals and objectives set forth in the Oregon Transportation Plan. The data collection, analysis, operational techniques and information sharing in an ATMS can become key elements of the region's congestion management system, meeting both State and Federal urban planning rules outlined in the Transportation Planning Rule, (Oregon 1991), Washington Growth Management Act of 1991 and the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991.

ORIGIN OF ATMS STUDY

The Portland Regionwide Advanced Traffic Management System Plan is part of an IVHS strategy initiated by the Oregon Department of Transportation with input from other agencies in the Portland/Vancouverarea. With assistance from the Federal Highway Administration, Portland became one of two pilot cities in the United States to initiate a regional Intelligent Vehicle Highway System (IVHS) Study. The purpose of the IVHS plan is to:

- Identify regional transportation problems and concerns;
- Identify potential IVHS solutions;
- Coordinate both current and future IVHS initiatives;
- Foster interagency cooperation and coordination;
- Provide an implementable program which allows the region to proceed with IVHS deployment in a systematic manner.

Substantial planning, analysis, research and agency review was conducted over an 18 month period to produce the ATMS Final Report. The work conducted as part of the pilot project is the first phase of IVHS deployment (master planning) in the Portland region. The report includes six informational source books where additional detail and background regarding the master plan can be found.

- Regional Corridor Operation: Existing and Future
- Signal System and Detection Technology Review
- Interjurisdictional Framework
- Incident Management Plan
- Traffic Management Operation Center Plan
- Advanced Traffic Management System Plan

THE STUDY AREA

The study area included the Portland region (within the Urban Growth Boundary) and portions of I-5, I-205, SR 14 and SR 500 in Clark County, Washington (Figure 1). Corridors were defined as distinct transportation service areas with multi-modal features including freeways, arterials and transit services. Six corridors were identified for the study: I-5, I-205, I-84, US 26, ORE 217, and ORE 99E/ORE 224. The I-5 corridor was evaluated in two segments: 1) north of downtown Portland into Clark County, including the Minnesota Freeway and I-405, and 2) south of downtown Portland (Baldock Freeway) to the City of Wilsonville.

THE PROBLEM

Traveller delay, caused or exacerbated by congestion, is on the rise in the entire region. Congestion occurs in two forms: recurrent and non-recurrent. Recurrent congestion occurs when peak period traffic demand exceeds the capacity of the roadway. There are about 28 miles of the regional freeway network currently experiencing this type of congestion during the peak periods. Assuming implementation of the current Regional Transportation Plan (RTP)[2], there will be 66 miles of the freeway network experiencing recurrent congestion in 2010. Figure 2 compares the levels of recurrent congestion for existing and future conditions.

Non-recurrent congestion occurs when an incident reduces capacity of a roadway by lane blockage or shoulder activity. Incidents can include accidents, stalls or breakdowns, debris or spilled loads on the roadway, some maintenance and construction activities, weather conditions and special events. Congestion due to incidents also increases the potential for secondary (and often more severe) incidents, further compounding operational problems. Studies have indicated that delay associated with both types of congestion in Portland costs $170 million per year. Also, further studies associate congestion with significant contributions to regional air pollution[4].

The region anticipates accommodating nearly 500,000 more people by the year 2010. Even with an investment in a balanced transportation infrastructure, as outlined in the RTP, congestion and peak-hour vehicle delay are anticipated to more than double by the year 2010. While investment in multi-modal access (transit, LRT, bus, bicycle, pedestrian) within the region will help control the growth of vehicle trips, it will not eliminate the growth of congestion (other modes would represent about eight percent of the PM peak mode share?. Travel on the region's circumferential routes will increase nearly 60 percent over the next 20 years. This increase will form congestion in areas currently operating at free flow speeds (for example I-205). Many of the hotspots listed in Table 1[6] are currently congested, and all will experience congestion in the future. Congestion hotspots are associated with increased driver frustration, delay, emissions, fuel consumption, and potential for secondary accidents.

Table 1
Top Dozen Future Hotspots

		Causes of Congestion		
Map No.	Route/Location	Demand	Accidents	Geometry/Grade
1	I-5 @ Interstate Bridge end Delta Park	X	X	X
2	Banfield (I-84) at I-205 and at I-5	X		X
3	I-5 s/o I-405 thru Terwilliger Curves	X	X	X
4	Sunset Highway (US 26) Sylvan	X		X
5	I-5 Upper Boones Ferry to Nyberg	X		
6	ORB 217 B-H Highway to I-5	X		
7	Sunset Highway Murray to ORE 217	X		X
8	ORE 99E s/o Ross Is. Bridge to ORE 224	X		
9	I-405 @ US 26	X		X
10	I-205 Southern Four Lane Segment	X		
11	I-205 at Foster	X		
12	I-205 at Airport and Mill Plain	X		

MISSION AND GOALS OF ATMS

An Advanced Traffic Management System can address the growing problem of congestion. The mission of the Portland ATMS Plan is:

To safely reduce delays, emissions and fuel consumption by users of the region's multi-modal transportation system and through cooperative action by public and private agencies.

The goals of the ATMS Plan include:

- Improve User Safety
- Reduce User Delay
- Improve Real Time Information Collection and Dissemination
- Enhance Traveller Information
- Develop an Efficient, Reliable and Maintainable ATMS System

KEY CHARACTERISTICS OF ATMS

Based on key findings of corridor evaluations, strategies were developed to achieve the mission and goals of the plan. Advanced Traffic Management Systems (ATMS) and Incident Management Plans have been developed to improve operations and mobility. The ATMS plan can enhance on-going initiatives in the region and provide an operational link to concurrent system plans. The following sections describe characteristics of the ATMS and Incident Management Plans:

ATMS Will Reduce **Congestion.** ATMS activities in Portland and other regions have been found to reduce congestion (particularly during incidents), increase peak travel speed, improve air quality, and increase safety by reducing the potential for secondary accidents.

ATMS Benefits Are Significant. The ability of ATMS to reduce delay, improve safety and reduce emissions has been documented. Improved surveillance can produce benefit/cost ratios of 5 to 1. Traffic signal system improvements can reduce the number of stops by 35 percent, delay by 20 percent, fuel consumption by 12.5 percent and emissions by 10 percent. Ramp metering can reduce delays by 50 percent. Use of changeable message signs during freeway incidents can reduce the vehicle hours of delay by one-third. Development of an integrated corridor and incident management system can reduce accidents by ten percent.

ATMS Benefits Help all Jurisdictions. The ATMS Plan includes freeway, arterial and surface street elements which can improve traffic operation for all jurisdictions. The plan includes features in all cities and counties within the region. Strategies are aimed at improving multi-modal mobility over the course **of** an entire day, as well as in the peak commute periods. The plan benefits all users, including goods movement, public transit, buses, bicycles and pedestrians. Effective corridor management can also reduce neighborhood intrusion by reducing congestion.

ATMS Benefits Transit Operation. Improved arterial operation directly benefits transit operation with better travel speeds and system reliability. Elements of the ATMS plan build upon an enhanced programmed investment in transit information collection technology, which uses buses on significant surface streets as vehicle probes[7]. Additionally, on-going Advanced Public Transit Systems (such as Tri-Met's transit signal priority, HOV lane priority and improved transit traveller information) can be integrated with ATMS to improve transit operation and increase transit use.

Incident Management is an Integral Part of ATMS. An Incident Management Program is an essential part of ATMS because it focuses operating agencies on non-recurrent congestion. ATMS and Incident Management, when applied regionally, lower jurisdictional boundaries and foster interagency cooperation. Support of incident management activities creates a common bond for all transportation providers and is a tangible display of cooperation and efficiency to the public.

ATMS is Cost Effective. For the cost of one mile of six-lane urban freeway, an 18 year regional ATMS master plan can be implemented (Portland and Southwest Washington urban areas). The plan would have positive influence for goods movement and travel on urban corridors, and for vehicle and bus flows on surface streets.

ATMS Optimizes the Existing System. The management strategies of ATMS maximize the efficiency of existing freeways and surface streets without increasing physical capacity. Hardware and software currently m-place, such as the Portland Series 2000 traffic signal system, are utilized as a building block. Its benefits are expanded in the ultimate ATMS system. In particular, incident management techniques can reduce the impact of temporary lane blockages, substantially improving the ability of the existing transportation system to operate efficiently.

ATMS Complements On-going Commercial Vehicle Operations Programs. Oregon and Washington have made significant investments to improve commercial vehicle operations by actions such as implementing weigh-in-motion systems as part of the HELP/Crescent program. ATMS can leverage this investment and further improve commercial vehicle operation in the urban area by providing better traveller information and managing congestion. The ATMS plan can become a key operating element of the Intermodal Management Plan for the region.

ATMS is Manageable and Reasonable. Implementation and operation of the programs will involve cooperative efforts of all jurisdictions, and will reduce the number of redundant and conflicting activities. A reasonable staffing plan has been developed by consolidating activities in the Traffic Management Operation Center. This center will provide for the efficient sharing of information between jurisdictions. The capital costs of the ATMS Plan are dispersed over a reasonable time span to reduce the impact on other programmed projects.

ATMS is Consistent with OTP, RTP and Tri-Met Strategic Plan. The Oregon Transportation Plan recommends the use of ATMS to promote safety, mobility and improved facility management. ATMS supports the Regional Transportation Plan goals of providing adequate mobility at reasonable cost through efficient use of existing facilities. An integrated ATMS plan can improve transit performance on arterials, improving transit customer service and ridership consistent with Tri-Met's Strategic Plan. Additionally, this ATMS plan is consistent with State of Washington IVHS initiatives outlined in Venture Washington.

ATMS Requires Systematic Implementation. To realize the full benefits of ATMS, a systematic approach will be taken toward implementation. Benefits of the ATMS Plan will accrue cumulatively and require implementation of the full functional process (surveillance, communication, processing, traffic control and traveller interface). The implementation of phasing is designed to achieve early benefits in the initial phases.

ATMS

There are two primary components of the ATMS Plan. One is the framework for policy, process and action between jurisdictions (outlined in the Interjurisdictional Framework Source Book). The second component is setting the priorities of ATMS features into a 6, 12 and 18 year plan'. The following sections summarize these components.

The ability of the framework to provide for a broad exchange of policy and action captures well-established regional management and innovative local agency involvement. Framework means a communication and reporting structure among agencies and system users. It involves policy groups, corridor management teams, an ATMS operation team and a management operation center.

ATMS FRAMEWORK

Policy Groups. Achieving a greater level of interjurisdictional coordination requires a framework to allow policy, funding, administrative, process, action and operational decisions to take place. Many of the key elements and staff are already in place. Figure 3 provides the recommended framework for the Portland region. Administrative, policy and funding decisions would be made at JPACT (Joint Policy Advisory Committee on Transportation, organized through Metro). A working group through TPAC (Transportation Alternatives Advisory Committee) would forward planning and programming of ATMS and Incident Management projects to JPACT. A separate ATMS subcommittee linked with congestion management would be developed to guide decision making. Key agency-level decision makers from the Road Authorities, Metropolitan Planning Organization and enforcement/protection groups would be represented. This group could be five to eight members with a primary goal to forward funding requirements to the regional process and delegate key policy objectives to operators as necessary to achieve the mission of ATMS and Incident Management.

Corridor Management Teams. The next level in the framework consists of the Corridor Management Teams (CMT). Corridor management teams are the key mechanism to allow diverse agency groups to coordinate their activities. With six corridors in the region, there may be individual or consolidated corridor teams for incidents and traffic management. A group has been developed for the I-5 corridor south of downtown Portland to address Incident Management. This group is identifying the needed level of agency cooperation and involvement to address the mission and increase the efficiency of incident management. Action plans are being developed which are suited to the participating agencies and a longer-term planning process is being established.

ATMS Operations Team. A separate ATMS operations team would be established to focus on integration of ATMS elements for the region. This group would be parallel to a CMT and would designate individual(s) to participate with the CMT. A single team could most effectively address these issues because many of the ATMS elements span different corridors, and a relatively small number of technical staff from several agencies can represent the interests of the entire region. This group would focus on signal systems, arterials, transit and freeway management. Linkage to the academic community through this group is critical in advancing the ATMS plan in a rapidly changing technological environment. The academic community (possibly through TRANSNOW) can have access to up-to-date research, and can perform testing and evaluation of system performance.

Management Operation Center. The framework foundation is the operating agencies and system users. These are the people who will make things happen on the streets. With the proper resources allocated from the administrative and policy groups and an action process developed at the corridor level, the agencies can execute their roles and responsibilities. To assure that multiple agencies can work together efficiently, a common resource point is needed to collect information in the field and make decisions. A Transportation Management Operation Center (TMOC) is critical to fulfill this need. The TMOC would process and transfer information to respond to incident and traffic management issues. Its goal would be to provide real-time information to travellers. Initially, this center may be a single person conducting focused functions. In the future, as the number and level of decisions increase, this center could include automated decision processes (artificial intelligence systems) using computer algorithms and staff from many agencies (either at the TMOC or remote at agency sites with direct communication links). The level of TMOC development would depend upon benefits gained with initial implementation and the commitment of agencies to maximize efficiency through consolidation of activities.

The TMOC can act as a center to coordinate and consolidate functional activities of ATMS and Incident Management. Figure 4 shows how the TMOC would interrelate to the various functions of the ATMS plan and activities within Incident Management. The initial step would be to coordinate several activities within the TMOC and link other agency activities together through the TMOC. In the long term (10 to 20 years), the TMOC could act as the central clearinghouse of information and action with other local agencies coordinating through the TMOC for central processing and information sharing.

ATMS PRIORITIES AND COSTS PLAN

The ATMS Master Plan is organized into three six-year increments. Features of the plan are organized by the following functional groups:

- Communication
- Surveillance
- Processing
- Traffic Control
- Traveller Interface

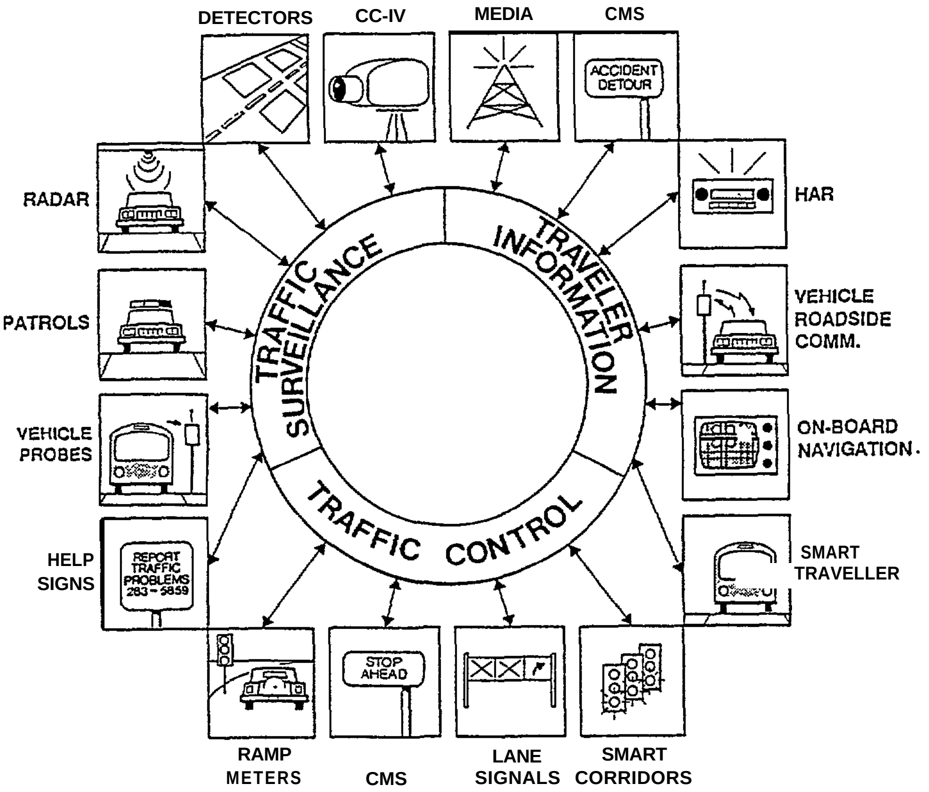

Figure 4

The first 6-year plan is detailed in Table 2[9]. A critical element of the plan is the development of a fully operational Traffic Management Operation's Center (TMOC). The TMOC becomes the center for communication between agencies, both in Oregon and Washington. Priorities are based upon existing and future corridor operation, focusing on recurrent congestion, traffic data, bottlenecks/hotspots and accident data. Figure 5 provides a graphic summary of the full, 18-year ATMS Plan[10].

During the initial year of the plan, agreements between agencies and other background work will be completed. The annualized cost for the plan is approximately $4 to $5 million per year over the term of the master plan. Table 3 outlines the total capital, engineering and operating/maintenance costs for the first six years of the ATMS Plan.

There are many benefits of the ATMS Plan. Quantifiable benefits include reduced delay caused by recurrent and non-recurrent congestion. Other accrued benefits which are more difficult to quantify include reduction in energy consumption, accidents, driver frustration and congestion-related vehicle emissions. Additionally, improved efficiency due to coordinated and cooperative agency actions can produce long term cost savings, particularly in relation to other region planning activities (congestion

Table 2 (Cont.)

1997	
Communication	$ 1,451,900
• Install US 26 conduit and fiber optic cable I-405 to ORB 217	
• Install I-5 fiber optic cable to Jantzen Beach and Terwilliger from downtown	
Surveillance	$ 837,500
• Install CCTV at high accident sites. I-5/Terwilliger, I-5/ Interstate Bridge	
• Evaluate detection used on I-5	
• Infill vehicle detection on US 26 and I-84	
Processing	$ 131,250
• Enhance TMOC Room	
Traffic Control	$1,662,500
• Significant surface street corridor priority #4	
• Infill ramp meters on US 26/ I-84	
• Signal retiming program for non-group signals, Stage 3	
Traveller Interface	$ 187,500
• Establish cable and network TV broadcast of traffic condition map	
• Coordinate traffic data with transit information	

1997 TOTAL $ 4,270,650

1998	
Communication	$ 1,841,250
• Install I-5 conduit and fiber optic cable from WSDOT to Jantzen Beach	
• Install ORB 217 conduit and fiber optic cable from Canyon Road to US 26	
• Install US 26 conduit and fiber optic cable from ORE 217 to 185th	
Surveillance	$625,000
• Upgrade and install weather stations on five bridges	
• Evaluate AVI for buses and CVO	
• Install CCTV along I-5 from SR 500 to Interstate Bridge	
Traffic Control	$ 1,962,500
• Significant surface street corridor priority #5	
• Install ramp metering on I-5 in WA	
• Traffic signal retiming program for non-grouped signals Stage 4	

1998 TOTAL $ 4,428,750

1999	
Surveillance	$ 375,000
• Install CCTV on ORB 99E at high accident/congestion sites using INET or cableless communication	
• Test video detection on US 26	
• Evaluate forms of detection used on US 26. I-84 and I-S	
Processing	$ 275,000
• Upgrade hardware and software	
Traffic Control	$1,400,000
• Significant surface street corridor priority #6	
• Demonstrate vehicle probe technology Tri-Met/C-Tran buses and/or CVO	
• Traffic signal retiming program for non-grouped signals Stage 5	$ 887,500
Traveller Interface	
• Install CMS on l-84, US 26 and I-205	
• Demonstrate use of CMS for vehicle speeds in morning hours	
• Purchase three (2 ODOT. I WSDOT) portable HAR's	

1999 TOTAL $2,937,500

Table 2 (Cont.)

1997	
Communication	$ 1,451,900
• Install US 26 conduit and fiber optic cable I-405 to ORE 217	
• Install I-5 fiber optic cable to Jantzen Beach and Terwilliger from downtown	
Surveillance	$ 837,500
• Install CCTV at high accident sites. I-5/Terwilliger, I-5/ Interstate Bridge	
• Evaluate detection used on I-5	
• Infill vehicle detection on US 26 and I-84	
Processing	$ 131,250
• Enhance TMOC Room	
Traffic Control	$ 1,662,500
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Surveillance	$ 375,000
. Install CCTV on ORB 99E at high accident/congestion sites using INET or cableless communication	
• Test video detection on US 26	
• Evaluate forms of detection used on US 26, I-84 and I-5	
Processing	$ 275.000
• Upgrade hardware and software	
Traffic Control	$1,400,000
• Significant surface street corridor priority #6	
• Demonstrate vehicle probe technology Tri-Met/C-Tran buses and/or CVO	
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1999 TOTAL $ 2,937,500

management systems, federal and state urban planning systems). Based upon the potential reduction in delays provided by the ATMS Plan, average benefit/cost ratios for the entire program would be approximately 5 to 1.

Table 3
Annual Operating and Maintenance Costs
1993 Dollars

	6-Year Plan
Annual Costs	
Operating Costs	$600,000
Maintenance Costs	$550,000
ANNUAL O/M COSTS	$1,150,000
Implementation Costs	
Capital Costs	$22,440,000
Engineering	$3,060,000
TOTAL CAPITAL + ENGINEERING	$25,500,000

ATMS IMPLEMENTATION

There are three steps necessary to implement the ATMS.

Regional Adoption of Strategy. ODOT should work with Metro to gain regional adoption of the ATMS Plan. This will require participation from the agencies involved to forward the plan for TPAC and JPACT to review and adopt. The data collection, analysis, operational techniques and information-sharing developed in ATMS can become key elements of other regional efforts. For efficiency, the ATMS Plan should be linked to other on-going management and data collection activities which can benefit from sharing information, including:

- Congestion Management Systems
- Other ISTEA mandated system plans, especially the Intermodal and Transit System Plans
- Pavement Management Systems
- Oregon Transportation Planning Rule and Washington Growth Management Act
- Federal and State Clean Air Act
- ODOT Corridor Studies
- Tri-Met Advanced Transit Systems
- Commercial Vehicle Operation Systems

Regional Adoption of Management Plan. A process for defining specific responsibilities and intergovernmental agreements must be established. An accord has already been signed by the major agencies participating in incident management for the region (ODOT, OSP, WSDOT, WSP, Metro, SWWRTC). Based upon the Interjurisdictional Framework developed for the ATMS Plan, an initial process was identified. The leadership in the development of the management plan will need to initially come from ODOT, working with participating agencies. This does not mean that ODOT must take lead responsibility in all tasks and activities, but will sponsor and facilitate the development of roles and responsibilities for the ATMS Plan and Incident Management Plan. This will result in the needed intergovermnental agreements and establishment of system data and control hierarchy.

Define a Revenue Stream. A revenue stream must be defined. Significant funding of ATMS-like activities has occurred in the past without regional organization. This plan provides the regional basis for funding. Funding sources must be dedicated to implement each increment of the Six-Year Plan. While funding for some program elements can come from the DOT's and local agencies, significant federal funding is needed. National Highway System (NHS), Surface Transportation Plan (STP) and Congestion Management/Air Quality (CMAQ) funds are all available for ATMS development. Federal rules allow use of STP and NHS funds for operating costs in initial years. Additionally, some limited IVHS funds are available as part of the nationwide deployment of IVHS[11]. While these and other funds exist for use in implementing the ATMS and Incident Management Plans, a funding stream must be established to sustain the capital, operating, maintenance and engineering costs of the system. In general, this would require around four million dollars a year for capital and about one million dollars for operation and maintenance at the end of the first six years. Some of these funds (both capitol and labor) are already being committed regionally, but not from a strategic regional perspective. The first six years of ATMS deployment are critical to the systematic development of ATMS. In particular the first five years of the ATMS plan are essential to receive the full benefits of ATMS. The next two six year blocks provide components for future funding.

Jump Starting Process. Probably most important to the development of the ATMS plan is establishing an early implementation team. This group of people should be an extension of the Technical Advisory and Policy Advisory Committees used during this study (possibly the early form of the ATMS team). The team would take charge of taking the ATMS plan and developing a project plan which fits agencies needs. They must initiate steps outlined in this ATMS plan, get activity on **track,** secure initial funding, schedule corridor management team meetings and monitor/report progress and effectiveness regularly to the JPAC subcommittee. To be effective, **this** will need to be **the primary** responsibility of a project manager for this implementation team.

A flexible approach to implementing the plan should be pursued. Opportunities may become present in earlier years to implement elements of the plan identified for later development. These opportunities may be possible due to **other** funding sources, coordination with roadway construction, coordination with local agency/private initiatives and/or transit priorities. These opportunities should be seized when available and integrated into this master plan.

By following these steps, the Portland region can implement an Advanced Transportation Management System which will benefit all users of the region's roadways and transit system, and enhances the environment for all area residents.

Notes:

1. Regional Transportation Plan. 1992 R&ion of the 1989 Update, Metro, January 1992.
2. Regional Transportation Plan. 1992 Revision of the 1989 Update. Metro, January 1992.
3. Texas Technology Institute Analysis, Table 2-3 Page 13, 1988.
4. **Research of air quality conditions in Los Angeles have indicated that 25 percent of regional emissions are due to traffic congestion alone.**
5. Based on Metro forecasting for year 1990 and 2010.
6. **Refer to Corridor Operations Source Book, Chapter 2.**
7. ATMS Plan Source Book, Chapter 5 .
8. ATMS Plan Source Book, Chapters 5 through 8 .
9. The summary of the initial 6-year and long term 18-year ATMS Master Plan is in the Appendix as Table A.
10. ATM.9 Plan Source Book, Chapter 7.
11. IVHS funds can be used for operational tests, typically for unproven technology, national research or early deployment planning (similar to this Master Plan).

Table A
ATMS Master Plan Outline

	INITIAL (6 YEAR PLAN)	LONG RANGE (18 YEAR PLAN)
COMMUNICATION		
Communication System	• Build off existing conduit system and copper wire, telephone drops, and INET • Install dedicated communication system around downtown loop, I-5 North to WSDOT District 4, I-5 South, US 26, I-84 to I-205 to TMOC • Use INET to link City of Portland and TMOC • Jointly use OSP microwave to WCCCA and/or remote sites • Integrate Arena program with TMOC • Study potential use of Tri-Met east-west fiber trunk	• Install dedicated fiber optic communication system on I-5, I-205, I-405, ORE 99E/224, ORE 217, I-84 to 102nd, US 26 to 185th, SR 14 between I-5 and I-205, and SR 500 between I-5 and I-205 • For remote field devices/operation centers, user leased telephone lines or wireless communication
SURVEILLANCE		
CCTV	• Cameras at major accident locations on freeways • Key locations include downtown loop, Interstate Bridge, Vista Ridge Tunnel, Terwilliger Curves	• Camera deployment at recurrent congestion and accident sites • Limited surface street deployment
Probe	• Coordinate with CVO program for probe data • Demonstrate use of Tri-Met/C-Tran buses as probes (AVL)	• Expand use of vehicle probes as technology matures
Voice	• Expand cellular telephone HELP service (*77) • Establish direct links with 911 centers • Determine links to media, bus drivers, CB radios	• Manage voice links with new technologies
Vehicle Detection	• Maintain/upgrade existing loops for ramp meters, count stations and CMS • Install and test other detection (eg. ultrasonic, microwave, infrared) • Test video detection on US 26	• Automate detection data collection in ATMS supervisor • Install vehicle detection systems for I-205, I-84 east of I-205, and ORE 99E/224 • Expand use of system detectors on significant surface streets • Transition to video detection and vehicle probes, as technology permits
Weather Detection	• Upgrade stations Fremont, Glen Jackson and Interstate Bridges and tie to TMOC • Install stations on Marquam and I-205 Willamette River and tie to TMOC	• Install stations on significant grades (I-5 Capitol Hill, US 26 Sylvan) and toward gorge where ice potential is high (I-84 east)
PROCESSING		
TMOC	• Construct TMOC at Barlow School and coordinate activity directly with OSP • Intertie TMOC and City of Portland by providing two-way data voice and video transmission • Standardize to Model 170 processors for all devices • Develop data base system	• Expand Barlow site to suit need of ATMS • Develop system supervisor • Develop freeway/arterial control systems • Develop automated incident detection system
TRAFFIC CONTROL		
Signal System	• Develop agency operational/maintenance agreements for significant surface streets • Finalize and implement signal system boundaries for coordination • Replace non-standard signal controllers to Model 170 (71 controllers) • Upgrade system software for 58 signals • Install Gresham area signal system • Install five WWV time clocks • Provide two-way communication for all signals on significant surface streets (51 miles of interconnect cable) • Develop signal retiming program • Coordinate with Tri-Met/C-Tran on Bus Priority Signal Systems	• Continue Initial 6-Year Program • Develop a Wide Area Network • Develop communication to local signal systems • Establish hierarchy of information sharing/control
Ramp Meter	• Implement new ramp meter control software • Implement ramp meter monitoring program • Infill ramp meters along corridors already under ramp metering control (I-5, US 26, I-84) • Install ramp meters on I-5 south of ORE 217 due to traffic growth	• Ramp meter at every ramp over 250 vph (minimum rate) during peak periods • Ramp meter I-205, I-5 in WA due to forecast operational problems • Ramp meter ORE 99E/224 as freeway segments develop • Implement freeway/arterial coordination
TRAVELLER INTERFACE		
CMS	• Upgrade ODOT/WSDOT CMS • Install new CMS on I-5 corridor at I-205, ORE 217, I-405, and I-205 • Install new CMS on US 26 approaching I-405 • Install new CMS at I-84 and I-205	• Install new CMS on I-84 to east and US 26 to west • Install surface street CMS on Pacific Highway/Barbur/I-5 corridor and along I-405 to demonstrate potential benefits
HAR	• Install HAR transmitter covering the downtown area	• Based upon results of first site, install 2 additional HAR sites at Airport and Delta Park • Three portable HAR for incident management (2 ODOT, 1 WSDOT)
ATIS	• Broadcast traffic operation condition map on Cable TV, media and activity centers • Coordinate with Tri-Met/C-Tran on provision of transit information to supplement highway information	• In-vehicle information systems • Voice synthesizing operation data • Links to personal communication devices